THE END OF EXCESS (PART I)

Testimony
in the front of the
House Financial Services Oversight
and
Investigations Subcommittee

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GREETING

Chairman Moore, Ranking Member Biggert, and Committee Members, thank you for the opportunity to testify in front of the House Financial Services Oversight and Investigations Subcommittee on Addiction to Debt and Leverage. I am David A. Walker, the John A. Largay Professor in the McDonough School of Business at Georgetown University. I represent only myself. My summary bio is attached to my written testimony as an appendix. You surely should not be subjected to my full academic resume.

CONCLUSIONS

I would like to urge the Committee to enhance competition among financial markets and institutions. Large firms that are managing their risk effectively are not necessarily too big, and our economy needs their services. It is the mismanaged firms that needed greater regulation – and some of them created the financial crisis and have already failed.

Abuses included institutions taking unreasonable risks in investing and lending, rating agencies not being sufficiently independent, consumers borrowing more than they could possibly repay, lenders making "NO DOC" loans, and government spending at levels that increased the fiscal deficit to 11 percent of GDP. There is blame for the financial crisis for every segment and almost every participant in the U.S. economy.

Three definitive recommendations I would like to offer the Committee are: the Office of Thrift Supervision be merged into the Office of the Comptroller of the Currency as soon as possible; small, insured depository institutions not be subjected to additional capital restrictions; and the FDIC be assigned the responsibility for consumer financial protection without creating a new agency and an additional bureaucracy.

INTRODUCTION

Background

I have developed my testimony in four segments: consumer debt; financial institutions leverage; corporate debt, and public debt. I will address several issues concerning financial reform where I hope to contribute some innovative ideas.

Assistance

I would like to acknowledge the assistance I have received with this testimony from several people. They are: my friend and co-author Dr. Thomas Durkin, formerly senior economist with the Board of Governors of the Federal Reserve; my son, Dr. Matthew Thayer Billett, the Henry B. Tippie Research Fellow and tenured full professor in the Tippie College of Business at the University of Iowa; my Georgetown research colleague Professor Keith Ord, and three premier Georgetown undergraduate students – Reilly Davis, Max Gaby, and Christina Hunt. These students are co-authors with me on scholarly research with me, and they are here today.

CONSUMER DEBT

Consumer Credit

For the record, I am submitting a copy of a forthcoming, peer reviewed study on "Long Run Credit Growth in the U.S.," which I have co-authored with Dr. Durkin and Professor Ord. The issue we analyzed was how levels of consumer and mortgage credit and debt have changed over the past 60 years. The media regularly proclaims that consumer debt is out of control. One expression of concern was in the series entitled "The Debt Trap," published in the *New York Times* from August 2008 to January of 2009.

There is a long term trend toward higher nominal debt levels. Borrowing by households grew sharply in the cyclical expansions of the past few decades. Total non mortgage consumer credit outstanding increased more than ten fold over the period 1975-2006 and approximately tripled in real terms.

Dr. Durkin, Professor Ord and I have shown that aggregate *real* consumer credit, *adjusted* for price changes and *excluding* mortgage credit, has increased at virtually the same annual rate as *real* U.S. disposable income over the past 60 years. When adjustments are included for changes in consumer prices, the percentage change in consumer credit outstanding virtually equals the percentage change in real disposable income (0.97). This includes consideration for unemployment and long-term interest rates. This result is consistent with 1957 estimates offered by Alain Enthoven, whom some of us remember as one of the McNamara Pentagon whiz kids in the early1960s.

Mortgage Credit.

These conclusions with regard to consumer credit are very different from the experience with mortgage credit. Many consumers levered their housing purchases by accepting mortgage credit far beyond their ability to repay. Mortgage lenders often made "NO DOC" loans, requesting almost no documentation to measure borrowers' ability to pay their obligations. There have been reports that the mortgage interest would be approximately 50 percent of a borrower's income, and the same borrowers had substantial other credit obligations.

Much of the recent consumer credit crunch has been caused by what I consider to be irresponsible mortgage lending and the unreasonable assumption that there would be no finite limit to which housing prices would rise. Perhaps, the best treatise on the subject was written by the late Federal Reserve Governor Edward M. Gramlich, Subprime Mortgages: America's Latest Boom and Bust, published by The Urban Institute. Governor Gramlich warned about the danger of subprime lending for approximately five years before other public policy makers took the issue seriously.

Some people have incorrectly blamed adjustable rate mortgages for the mortgage credit crisis. Adjustable rate mortgages allowed many legitimate borrowers to purchase a home they might otherwise not have been able to purchase. The problem was the high reset rate, often well above market rates, when the reset was required on subprime loans and the borrower had no equity in the property and no alternative, except to accept a high reset rate or default.

I believe one of the greatest problems in the housing crisis was the "supervision" by the Office of Thrift Supervision. The failures of IndyMac and Washington Mutual were failures by institutions supervised by the OTS, and some have argued that if these thrift holding companies had been supervised by the Fed instead of the OTS, the results could have been somewhat different. This would be just one more of many examples where the independence of the Federal Reserve is *essential*.

Some stipulations of the deregulation legislation in 1980 gave savings and loans new powers to make short term consumer and commercial loans and to adjust the interest rates on mortgages to market rates. The risk profiles in the next section suggest that these changes, three decades ago, did not solve many of their difficulties.

I am a strong proponent of merging the OTS into the Office of the Comptroller of the Currency, and I would urge this Committee and the Congress to pass a separate bill to accomplish this long before you complete the complex regulatory reform legislation. The recent experiences with IndyMac and Washington Mutual seem, to me, to suggest that in its current form, the OTS has many of the same problems that the Federal Home Loan Bank Board had as a thrift regulator.

FINANCIAL INSTITUTIONS' LEVERAGE

The Financial Crisis and TARP

The financial crisis introduced the American public to the activities of many uninsured financial institutions that operated with much greater risk than was realized. The insured depository institutions are, in many ways, very different, from the investment banks and insurance firms. To save the U.S. financial system, it was deemed essential by most experts that the Congress and the Treasury needed to provide temporary support, while the risks and often unsavory behavior was analyzed.

I believe that the TARP commitment was essential. Philosophically, many are hesitant to bail out any financial institution or any firm that is in jeopardy, and I generally agree with that view. Going forward, I argue that no firm, nor any institution should expand to the extent that it would be Too Big To Fail. The goal should be for financial regulators to be empowered and prepared to deal with large institutions that have financial difficulties before their difficulties suggest that they might fail.

Mark Flannery (2010) has proposed a system that would require large banks to hold debt instruments in the form of Contingent Capital Certificates that would automatically convert to bank equity, if the market value of a large bank's equity fell below an established threshold. This would eliminate regulatory delays and negotiations when a bank might be in jeopardy. Establishing the threshold as a function of the market value of a bank's equity would provide a daily valuation about whether the debt Certificates would need to be converted to capital.

Max Gaby and I have a paper on "Impacts of TARP on Financial Institutions" that I would like to include in the record for these hearings. We believe that insolvency for any

of the four largest U.S. commercial banks during the financial crisis could have virtually destroyed the U.S. financial system and would have had serious detrimental effects on global financial markets. These four banks dominate much of the U.S. banking system as sources of short-term capital and represent almost 40 percent of American total bank assets. Max and I completed bank stress tests using publicly available data to show the vulnerability of the four largest banks. Our results were consistent with the confidential Federal Reserve Supervisory Capital Assessment Program.

It is surely true that some of the TARP funds will never be repaid, but I believe the cost, compared to the potential cost of a single failure of a very large bank, had to be accepted. It was a short-term, not a long-term solution. It is my opinion that our economy would be rebounding much more slowly than it has if we had not implemented the TARP program. We should not forget that the Dow Jones Industrial Average has rebounded from 7,609 to approximately 11,000 in the 13 months since March 31, 2009

Financial Institutions' Debt, Equity, and Risk

The debt and leverage experiences of our insured depository institutions can be examined via simple risk ratios. Table 1 provides three ratios that reflect various aspects of financial risk for commercial banks and savings and loans, separated into two size categories for institutions with assets above and below $1 billion. The 29 quarterly observations from December 2002 through December 2009 are readily available from the FDIC web site (www.fdic.gov).

The first four columns in Table 1 provide the means, standard deviations (S.D.) and the ratio of the mean to the standard deviation for each group of institutions. (With an adjustment for the number of observations, which would reduce the S.D., the third number would become a t-statistic). When comparing the ratios for two groups of institutions, if the mean for the first group (Y) is larger than the mean for the second group(X), the first group is deemed to be more risky [(Y-X) > 0].

The first ratio measures the proportion of Tier 1 Capital that supports their nondepoit liabilities. These liabilities are portions of an institution's obligations that could most easily create serious risk. Insured deposits are not risk free, and they do represent a moral hazard to the financial system, but competitive markets, along with FDIC insurance, pretty well determine the pricing and values of these liabilities.

The calculations for risk ratio 1, [(Liabilities – Deposits)/Tier 1 Capital], show:

large banks and large S&Ls are similar (column 5);
small S&Ls are more risky than small banks (column 6);
large banks are more risky than small banks (column 7);
large S&Ls are more risky than small S&Ls (column 8).

Large banks and S&Ls are the ones that require the greatest risk monitoring.

The second ratio shows that only the large banks have a sufficient amount of derivatives to warrant serious concern. Thus, regulations that are deemed necessary for derivative products for insured depository institutions do not need to apply to many institutions.

The third ratio is the primary consideration in the Basel Capital Standards. In each case, the mean Tier 1 Capital Ratio of Risk Weighted Assets exceeds the standard deviation. By size, large banks hold less Tier 1 Capital than S&Ls (columns 5 and 6) and small institutions hold more Tier 1 Capital than large institutions (columns 7 and 8).

Regulatory Action

I would like to offer the Committee and your colleagues' my experience at the FDIC years ago, when the Department of Energy was established. I would urge you NOT to create a new government agency for consumer financial protection. Please consider placing the responsibility with the FDIC. As an independent agency, with separate budget authority, many necessary consumer protection systems already in place, and an existing consumer affairs department, the FDIC is ideally suited to implement the consumer financial protection that the Congress deems necessary.

Another government bureaucracy is not what consumers need. When the Department of Energy was formed, employees who already had government status, and could be transferred, were offered financial incentives to move the Energy Department. The incentives were perverse because employees who accepted offers were often people who were not well regarded in their current agencies and had few prospects for promotions or greater responsibility.

Balancing Demands

Depository institutions have faced a confusing environment during the financial crisis. They have been urged to reduce their risk and prepare for large loan losses. In response, the institutions reduced lending until very recently. However, they have been urged to lend or to be cooperative with borrowers in financial difficulty to support the economic recovery, while they have been admonished to control, or even to reduce, their risks.

CORPORATE DEBT

For 2000-2009, private sector debt and leverage, increased for large and small firms. The Federal Reserve Flow of Funds Data provide total corporate debt, separated by long-term and short-term liabilities by organizational form -- nonfarm nonfinancial corporations (Z1, B102) and nonfarm noncorporate business (Z1, B103).

Table 2, for the decade, the ratio of total debt to assets for large and small firms averaged 49.0 and 43.5 percent, respectively, across the 40 quarters. These percentages reflect substantial differences by firm size in ability to attract debt. When total debt as a ratio to assets is separated by short and long term commitments, small firms depended on short term debt to a much greater degree (28.0 versus 16.5 percent) and corporations had more long term debt (32.5 versus 15.4 percent).

TABLE 1. RISK RATIOS FOR INSURED DEPOSITORY INSTITUTIONS

Ratio 1: (Liabilities - Deposits) / Tier 1 Capital								
	1	2	3	4	5	6	7	8
	Large Banks	**Small Banks**	**Large S&Ls**	**Small S&Ls**	**Large Banks - Large S&Ls**	**Small Banks - Small S&Ls**	**Large Banks - Small Banks**	**Large S&Ls - Small S&Ls**
Mean	3.59	0.85	3.52	1.25	0.07	-0.40	2.74	2.27
S.D.	0.38	0.06	0.54	0.07	0.42	0.03	0.35	0.50
Mean / S.D.	9.50	14.63	6.46	18.00	0.17	-13.43	7.78	4.53

Ratio 2: (Notional Value of Derivatives) / Tier 1 Capital								
	1	2	3	4	5	6	7	8
	Large Banks	**Small Banks**	**Large S&Ls**	**Small S&Ls**	**Large Banks - Large S&Ls**	**Small Banks - Small S&Ls**	**Large Banks - Small Banks**	**Large S&Ls - Small S&Ls**
Mean	201.78	0.11	0.13	0.03	201.65	0.08	201.67	0.10
S.D.	44.22	0.04	0.07	0.02	44.25	0.03	44.19	0.07
Mean / S.D.	4.56	2.78	1.87	2.04	4.56	2.55	4.56	1.43

Ratio 3: Tier 1 Capital / Total Risk Weighted Assets								
	1	2	3	4	5	6	7	8
	Large Banks	**Small Banks**	**Large S&Ls**	**Small S&Ls**	**Large Banks - Large S&Ls**	**Small Banks - Small S&Ls**	**Large Banks - Small Banks**	**Large S&Ls - Small S&Ls**
Mean	9.56	13.37	14.13	17.20	-4.57	-3.83	-3.81	-3.07
S.D.	0.53	0.26	1.36	0.52	1.47	0.29	0.66	1.29
Mean / S.D.	18.08	51.31	10.37	33.36	-3.10	-13.39	-5.77	-2.37

Large banks and S&Ls have total assets over $1 billion. Small banks and S&Ls have total assets under $1 billion. Columns 5-8 are differences.

TABLE 2. BUSINESS DEBT RATIOS

	Total debt/assets	long term debt/assets	short term debt/assets
Corporations	49.0%	32.5%	16.5%
Small firms	43.5%	15.5%	28.0%

The debt/asset ratio increased for small firms over the decade. Corporate debt levels peaked in 2002 and declined through most of the rest of the decade until the recession began at the end of 2007.

The inverse of these debt ratios is the ratio of equity to total assets. Through the decade, small firms' equity ratios decreased, while large corporations' equity ratios increased until the 2007 recession, when their equity ratios declined.

Through the decade, small firms' riskiness increased. This is particularly important for these firms because they have very limited access to capital markets. This is the experience that has been exhibited by many bankruptcies of small firms during the current recession. Moreover, as unemployment increased, debt ratios (total, short-term, and long-term) increased and equity ratios declined.

When estimating the slope coefficients (b and c) for

$$DEBT/ASSETS = a + b\,U + c\,REC$$

U represents unemployment and REC indicates whether or not it was a recession quarter. The coefficient of unemployment, b, is positive, and highly significant for large and small firms with long term as well as short term debt. The recession coefficient, c, is significant for short-term debt levels for corporations as well as small firms. Small firms increased their long term debt (often mortgage debt), when their equity declined, during recessions. Many small firms virtually exist on an entrepreneur's borrowing on their primary residences via first mortgages and home equity loans.

The sensitivity of the debt ratios to unemployment is much greater for small than large business. The differential is at least 20 percent for every tabulation.

These results indicate that the riskiness for small firms has increased, and equity declined, during the past decade. This has serious consequences since small businesses employ 51 percent of the U.S. domestic work force and produce the same percentage of the non farm private gross product according to the U. S. Small Business Administration. Moreover, in the past 15 years, 64 percent of new American jobs were created by small firms (Gramigna, 2009, page 9).

US PUBLIC DEBT

Fiscal Deficits

The U.S. aggregate fiscal debt has increased dramatically since World War II under both Republican and Democratic administrations. When it is committing financial support to a country, the IMF usually establishes a five percent country target maximum fiscal deficit – GDP ratio before funds can be released.

The European Union requires its members to maintain fiscal deficits below three percent of GDP. These targets have been difficult to achieve during the current global financial crisis. For 2010, fiscal deficits as a percentage of GDP are projected to be 11.1 for the U.S., with similar ratios for much of industrialized Europe. The ratios are about half this size for most emerging market countries with limited capital markets. (The Economist, May 1, 2010, page 98).

The graph below shows the percentages by which U.S. fiscal deficits have differed from three percent as a ratio to GDP (FDY3PER) since 1997.

A corollary to constraining a country's fiscal deficit limits aggregate debt (cumulative deficits). Annual debt service is a major annual fiscal expense for a country with a high debt level, even if one year's fiscal budget were balanced. The European Central Bank has adopted a country debt target of 60 percent of GDP, in addition to a maximum annual fiscal deficit ratio of three percent.

U.S. federal government spending has already increased the 2010 fiscal deficit to approximately 1.2 trillion dollars to an aggregate debt level, expected to exceed $14 trillion (approximately equal to GDP). At an average long run interest rate of 5 percent, the $700 billion annual cost of financing this debt would exceed 60 percent of all U.S. federal annual individual plus corporate income tax receipts.

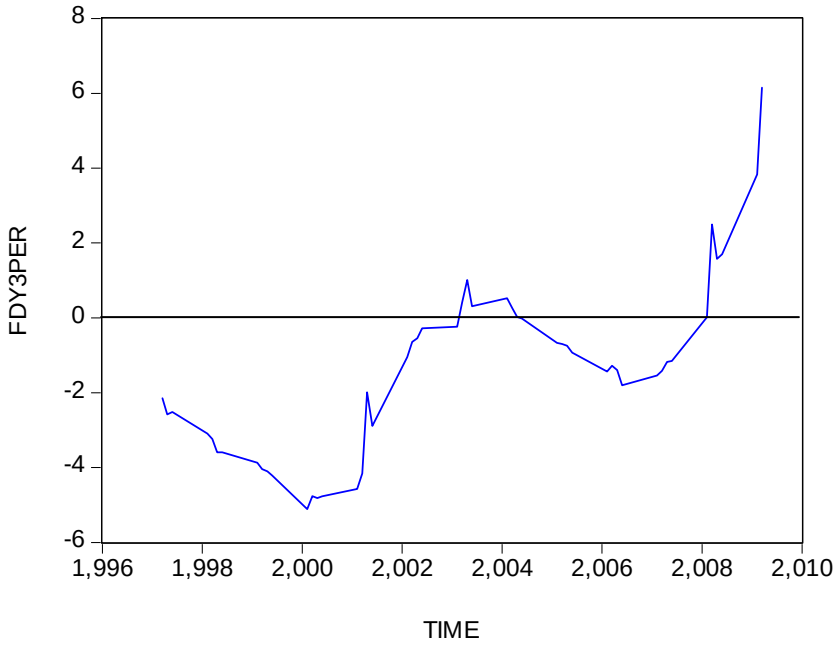
Some economists favor allocating the TARP repayments to other public sector programs to try to reduce unemployment, rather than paying off the additional debt incurred to fund TARP. This could be inflationary. Your Committee surely knows the opinions of budget director Peter Orszag whose policy studies with William Gale (Gale and Orszag, 2002 and 2005) argue that larger fiscal deficits lead to rising long-term interest rates, which agree with a multitude of other studies.

Policy Models

In the mid 1950s, Professor A. W. Phillips developed a theoretical model to test how fiscal deficits (FD) would fluctuate with differences in actual and full employment output (GDP actual – GDP full). I have applied this model to a number of different cases. For the US, since 1997, the fiscal deficit has varied inversely with the difference between actual and full employment output. When actual GDP was below full employment GDP, there have been larger fiscal deficits, which stimulate the economy and move aggregate output towards full employment output. When actual GDP exceeded full employment GDP, fiscal deficits were reduced, probably as a result of larger tax receipts. This is part of a research project that is in progress.

We need to reduce U.S.deficits, or it is highly likely that we will have serious inflation. There are areas where spending can be reduced and some tax deductions may warrant reduction or elimination. I urge the Subcommittee to do everything possible to avoid any burdensome regressive taxes, like a flat tax, to deal with the U.S. fiscal deficit.

FIGURE 1. U.S. FISCAL DEFICIT MINUS 3 PERCENT



THANK YOU

Thank you for this opportunity to meet and speak with you. I would be pleased to attempt to answer any of your questions and to provide further information to the Committee. As my students can tell you, I am a strong believer in answering "I don't know" to at least some of the complex economic questions we are facing in our current volatile, uncertain economic environment.

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APPENDIX

David A. Walker

Background

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Background

Dr. David A. Walker is the John A. Largay Professor and director emeritus of the Capital Markets Research Center, which he directed for 17 years at Georgetown University. He was recently elected to membership in the Cosmos Club. The Israel Council on Higher Education selected him as a member of their business school quality assessment team for the Israel Council on Higher Education. Dr. Walker is currently a board member for the George Town Club and the Georgetown University Student Credit Union. He chaired the Governing Board for the Credit Research Center for eight years. His biography appears in recent and many previous editions of *Who's Who in America, Who's Who in the East,* and *Who's Who in Finance and Industry*.

Dr. Walker served two terms as chair of the Board of Trustees and is past president of Financial Management Association International, representing 4700 academics and practitioners. He has served as Executive Editor of the *Journal of Financial Research*, Co-editor of the *Journal of Small Business Finance*, and an editorial board member for seven finance journals.

Dr. Walker joined the Georgetown faculty in 1980, after serving as Director of Research for the Office of the Comptroller of the Currency and Financial Economist for the Federal Deposit Insurance Corporation. He served as Associate Dean for the Georgetown Graduate MBA and MS Tax Programs during their initial accreditation, and he has chaired many search committees and academic committees during his 28 years at Georgetown. Previously he taught at Northwestern University, the Pennsylvania State University, the George Washington University, and Iowa State University, where he earned his Ph.D. and Master's degrees in quantitative economics.

Dr. Walker's special expertise is developing quantitative analyses to represent financial and economic situations using sample and population data. He has applied this expertise to a variety of research questions, consulting opportunities, and legal issues.

Research

Dr. Walker has published seven books and monographs, 55 scholarly, peer-reviewed articles, and presented many research and policy studies at professional meetings. The topics include financing and operations of global and domestic financial service firms, financing small companies, mutual fund performance, trade credit demand and supply, and monetary and fiscal policies for emerging market economies. His recent published papers are: "Long-Run Credit Growth in the U.S," *Journal of Economics and Business*, "Presidential Election Forecasts," *The Forum*, "Impacts of Bank Acquisitions on Shareholder Returns" in *Bank Accounting & Finance,* "Predicting Presidential Election Results" in *Applied Economics,* and "Emerging Markets' Deficits, Privatization, and Interest Rates" in *Economia Internazionale*.

Teaching and Lectures

Professor Walker teaches a variety of courses on global financial markets and institutions, applied macro-economics, and managerial economics. At various times he has taught courses in management science, micro-economics, mathematical economics, and statistics. He has also lectured and conducted courses in Australia, China, Estonia, Hungary, India, Japan, Poland, Singapore, and Thailand and was previously selected for a Fulbright Award in India. Dr. Walker recently testified in front of the House Committee on Small Business concerning small business credit costs and supply.

Consulting

Dr. Walker is currently a consultant to the World Bank, the Promontory Financial Group and Nathan Associates. He has served as consultant to the World Bank, the U.S. Department of the Treasury, the U.S. Small Business Administration, and numerous companies. For the World Bank, Dr. Walker is currently involved in a project on contracting public services to the private sector in The Philippines and previously he and several colleagues developed models to identify factors that would lead to successful ventures for new firms in emerging markets. Dr. Walker was a member of a blue ribbon commission to review the Treasury's efforts to implement of electronic processing and payments options for Treasury Bill accounting and to reduce paper processing and bookkeeping.

Dr. Walker has analyzed trade credit availability and demand for the U.S. Small Business Administration (SBA). He also developed cases for state and local governments' delineating their experiences contracting services with the private sector. Dr. Walker created the SBA proposal for a small business loan guarantee program with a secondary capital market. He has published studies on financing small firms through venture capital, informal investment, trade credit, and bank credit.

Dr. Walker's consulting work with Nathan Associates has involved price fixing cases, studies of long-term debt and equity levels and their impacts on Federal revenues and expenditures, and review of numerous other projects. He serves on the academic Advisory Board for the firm, with which he has had an affiliation for more than 25 years.

Case Experience

Dr. Walker has been qualified as an expert economist by eight Federal, state and local courts and for the Federal Energy Regulatory Commission. Dr. Walker has completed legal, case-oriented economic analyses for a variety of clients. His clients have included: prestigious and smaller law firms, the U. S. House of Representatives, Nathan Associates, Memphis Gas & Light Company, the District of Columbia, and Dunkin' Donuts, Inc.

The issues on which he has qualified or been retained to provide expert reports include: lost income, valuation of financial assets, bank management and financial practices, financial institutions' asset portfolio management, costs of capital, bank share valuations, profit projections for privately held firms and franchises, business profits and sales and personal income projections, and valuation of professional medical, legal, and business services.

HONORS AND RECOGNITION

Elected member, The Cosmos Club, 2009
Who's Who in America - 48th edition and all later editions
Who's Who in the East - 22nd edition and all later editions
Who's Who in the American Education
Who's Who of Emerging Leaders in America
Who's Who in Finance and Industry
American Men and Women of Science – Economics
National Defense Education Act Fellowship, 1962-1964
Southern Finance Association Service Award, 1987
Financial Management Association Service Award, 1991, 1995, 2005
Beta Gamma Sigma, 1999
McDonough School of Business Distinguished Service Award 1987, 2005

TEACHING

Georgetown University Full-Time Faculty (1980-present)

Courses
Financial Services Management, graduate, 2 sections
Macro-economics - graduate, 7 sections
Global Financial Markets and Institutions - graduate, 7 sections
Global Financial Markets and Institutions - undergraduate, 38 sections
Management Science - graduate, 2 sections
Managerial Economics - graduate, 6 sections
Managerial Finance - graduate, 2 sections; undergraduate, 2 sections

Thesis Committees
Victoria Lynn Zyp, Arab Studies, M.A., 2009
J. D. Foster, economics, Ph.D., 1989
Walid Hasheur, economics, Ph.D., 1983
David Leahigh, economics, Ph.D., 1982
James W. Fay, economics, Ph.D., 1981
Richard Browning, economics, Ph.D., 1980

RESEARCH

BOOKS

Small Business in America, Institute fur Wirtschaftspolitik an dur Universitat Zu Koln, Koln, 1989.

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Mathematics for Economic and Business Analysis, Goodyear Publishing Co., March 1976 (with R. E. Forsythe).

RECENT REFEREED JOURNAL ARTICLES

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"Presidential Election Forecasts," The Forum, A Journal of Applied Research in Contemporary Politics, (editorial referee), December 2008.

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"Performance Persistence in Fixed Income Mutual Funds," (with William G. Droms), Journal of Economics and Finance, Fall 2006.

"Impact of Community Bank Mergers on Acquiring Shareholder Returns" (with Alan Mayer-Sommer and Sharon Sweeney), Journal of Performance Management, Vol. 16, No. 1, 2006.

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"Financial and Economic Determinants of Privatization," Economia Internazionale, February 2002.

"Performance Persistence of International Mutual Funds," (with W. G. Droms), Global Finance Journal, December, 2001.

"Persistence of Mutual Fund Operating Characteristics: Returns, Risk, Turnover Rates, and Expense Ratios" (with W. G. Droms), Applied Financial Economics, Volume 11, 2001.

COMPLETED PAPERS UNDER REVIEW

"Anticipating Presidential Election 2012"

"Costs of Short-Term Credit for Small and Large Firms"

"Impacts of TARP on Commercial Banks" (with Max Gaby)

"Privatization and Fiscal Deficits in European Emerging Markets" (with Christina Hunt)

RESEARCH IN PROGRESS

A Macro-Dynamic Economic Policy Model of the US

Exiting US Economic Recessions (with Reilly Davis and Keith Ord)

LONG-RUN CREDIT GROWTH IN THE US

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LONG-RUN CREDIT GROWTH IN THE US

ABSTRACT

The paper explores the long term income elasticity of consumer and mortgage credit growth since World War II. It also examines other economic factors, to determine whether recent credit use is anomalous. Two-stage least squares shows consumer credit income elasticity to be slightly below 1.0, taking other factors into account. A vector autoregressive error correction (VAREC) model for cointegrated variables with unit roots determine short-run and long-run credit impact multipliers which are consistent with the elasticities. Except for 1974-1979, the long-run consumer credit impact multiplier of 0.23 is very close to the debt-income limit that Enthoven projected as long ago as 1957. These results are very different from the simplistic media perspectives.

I. INTRODUCTION

Many observers blame the recent credit crunch and associated volatility in financial markets as arising in large part from two circumstances: some consumers' misuse of credit and some lenders making credit available to borrowers who were unlikely to be able to satisfy their credit obligations in the long run. Before the credit crisis, it appeared that these consumers might be able to satisfy their obligations because (1) many borrowers with large obligations only needed to pay the interest on their loans, with no principal repayment, and (2) both consumers and lenders assumed housing prices would increase substantially before payments adjusted to higher levels, allowing consumers to refinance as needed. In some cases, mortgage borrowers were not even obligated to pay all of the interest on their mortgages: their commitments were scheduled to "reset" to require higher interest payments plus principal amortization that they might not be able to afford, but the resets were scheduled for later, when house prices (and the borrowers' incomes) were expected to have risen.

Much of the recent discussion of the amounts of new mortgage debt advanced and lenders' practices in extending it mirrors similar kinds of complaints about profligate consumers and over-eager lenders leveled at non mortgage consumer credit market participants for decades, notably including credit card users and providers in recent years. But because of recent widespread concern about debt growth, it is an ideal time to reexamine the long run experience concerning consumer's use of both consumer and mortgage credit. Consequently, this paper examines empirically the long term trends of how American consumers have used consumer and mortgage credit. The empirical emphasis is on real, rather than nominal, levels of credit, adjusting for inflation. Whenever a recession appears to be on the horizon or when financial markets are somewhat volatile, the media portrays the American consumer as being

overextended in credit markets, but these reports usually do not adjust for growth in disposable incomes and other factors and/or increases in prices over time. They also do not note how current cyclical experience relates to longer term trends. More technically, there are surprisingly few recent analytical research studies to support or to dispel the reports of long term explosive use of consumer and mortgage credit often found in the popular press, despite the attention to short term fluctuations in aggregate consumer debt (CC + MC) and its components, and their impacts on volatility in the financial markets.[1]

Section II reviews trends in credit and other related macro-economic variables over the past 60 years. It provides a foundation for analysis of long run credit trends by examining some basic perceptions and reviewing two of the major, older analytical studies on consumer credit growth. Reviewing these older studies partly reflects the relatively limited analytical attention that the subject has received, but these older studies also provide the basis for hypotheses that continue to be relevant. The data and long term credit trends are discussed in Section III as a basis to develop dynamic credit models. The dynamic autoregressive models with error corrections, parameter estimates, and impact multipliers for consumer and mortgage credit are developed in Section IV, which includes discussion of the degree to which credit growth in 2007-2008 was predictable from prior experience. Section V provides an application of the model to forecast the credit levels for the unusual years of 2007 and 2008. The conclusions follow in Section VI.

II. PERCEPTIONS AND EARLY STUDIES

Perspectives on Long Term Growth

Although the Federal Reserve's Flow of Funds Accounts clearly show that the consumer sector of the U.S. economy is actually a net lender in financial markets (usually through financial

[1]See references for a bibliography, including a few studies not otherwise referenced here.

intermediaries), households still borrow substantial amounts for housing, durable goods, education, and other purposes. Continuing a long term trend toward higher nominal debt levels, borrowing by households grew sharply in the cyclical expansions of the past few decades. For example, total non mortgage consumer credit outstanding (CC), which is an important component of household liabilities, increased more than ten fold over the period 1975-2006 and approximately tripled in real terms (see Table 1), thereby providing financing for a significant portion of major consumer outlays during those years. Many other household economic measures have also risen sharply over this period and generally in the years since World War II, including employment, income, assets, and wealth.

TABLE 1 HERE PLEASE

Despite the obvious cyclical contribution of credit availability to support the expansion of consumer spending (and economic growth), the increase of consumer debt in cyclical upswings inevitably leads to expressions of concern.[2] Because the periods of most rapid growth in consumer credit usually occur early in the business cycle, later cyclic stages are perennially subject to the contention that consumer debt has risen "too fast" or that the level has become "too high." Doomsayers assert that high and increasing debt levels lead inevitably to overindebtedness and are likely to cause delinquencies, a spending slowdown, recession, and rising unemployment. Some of this concern is directed towards housing-related debt, especially recently in the subprime area, but much concern aims also at consumer credit, in the recent past decades particularly at credit card debt. Certainly, communications media pronouncements about consumer credit growth have generally been dismal (see Durkin and Jonasson, 2002). It is

[2]See, for example, front-page articles in the Wall Street Journal for June 17, 1964, January 29, 1970, March 26, 1973, June 28, 1977, December 2, 1985, and February 2, 1987, for some older expressions of concern. More recently, see August 2008 – January 2009 series "The Debt Trap" in the New York Times.

difficult to estimate how influential such statements have been, if at all, but even the casual empiricism of asking one's neighbors for their views of the domestic credit picture reveals the widespread notion that consumers' credit use has grown too fast for too long.

One possible cause for consumer credit growth is the hypothesis of consumer profligacy and some sort of inexorable desire to live beyond one's means. Other possible explanations for credit growth range from statistical artifacts associated with how the data are collected to changing population demographics and generally greater macro-economic stability after the Great Depression and World War II that have produced a greater willingness to accept risks sometimes associated with increased leverage to support larger portfolios of productive assets.

There is also the possibility that leverage, or more properly the asset accumulation that greater leverage assists, is a luxury good where an income elasticity greater than unity might reasonably be expected. There is no reason why debt measures should remain the same as income rises. Credit, or at least large purchases like housing, large durable goods including vehicles and appliances, home modernization, college educations, and major hobby items often associated with credit use are mainly luxury goods. As such, they are precisely the kinds of purchases that might be expected as income rises. Under these circumstances, then credit use would also reasonably be expected to rise as income rises. This paper does not explicitly attempt to model the behavioral foundations of such a possibility, but presents an empirical approach to exploring correlates of postwar credit growth and explaining the trends empirically.

FIGURE 1 HERE PLEASE

Figure 1 shows annual percentage growth rates for consumer and mortgage credit 1946 - 2006. It is immediately apparent that credit growth has not been steady: annual growth rates have fluctuated substantially over the business cycles. More interesting is how the cyclical episodes

have been relatively similar, excluding the unprecedented and unduplicated upheavals associated with the aftermath of the Great Depression of the 1930s and the period of consumer credit restrictions during World War II. Annual growth of consumer credit outstanding peaked in each of the other cyclical episodes of the post World War II period at roughly a 15-19 percent growth rate for a short period in each upswing. The all time postwar highs occurred in the earliest post World War II period when consumer credit was responding to the end of wartime controls during the 1940s. The postwar annual growth rate in mortgage credit has been somewhat less sharp in its cyclical fluctuations in the postwar period, reaching a peak growth rate of 16-17 percent in the early 1950s and again in the 1970s. There has not been a recent sharp increase in the growth rates in either series. Although the relatively consistent pattern does not provide a forecast, it is an indication that the growth of consumer and mortgage credit in recent decades is not anomalous or startling in percentage terms. Consumer and mortgage credit outstanding grew rapidly in recent cyclical upswings, but they always have done so in upswings. The question is what economic conditions and variables are associated with consumer and mortgage credit growth.

Enthoven and Hunter Studies

Relatively few econometric studies have examined the long term growth of consumer credit.[3] Two of the most interesting papers were published more than a generation ago by Alain Enthoven (1957) and Helen Manning Hunter (1966). There are subsequent studies (many in the bibliography), but few are as interesting or insightful.

Enthoven was not attempting to model consumer credit use behavior explicitly, but he designed a dynamic model based on cross section evidence of consumers' credit use to explain

[3]For discussion of consumer credit growth and especially its cyclicality, see Prell (1973), Luckett and August (1985), and Johnson (2005). There is further discussion of relevant studies at greater length in Durkin, Elliehausen, Staten, and Zywicki (2010), Chapter 2.

the rapid growth of consumer credit and the rise of the debt-income ratio after World War II that caused so much concern in the mid 1950s. He assumed the future economy would be characterized by increasing aggregate income due both to increasing population and rising household income. If consumer credit use were chiefly among younger families as the cross section evidence suggested, then credit outstanding would increase as the population increased. Enthoven postulated a dynamic growth model to demonstrate the implications of these basic assumptions. The solution to his first-order differential equation showed that the debt-to-income ratio would approach a long run asymptotic stable limit from below, dependent upon (1) the ratio of the growth of consumer credit relative to income and (2) the growth rate of income itself.

Using the debt and income growth experience for 1945-1956 as the basis of his parameters, Enthoven derived the conclusion that the long term expectation for the ratio of consumer installment credit to income was approximately 19 percent. Since this asymptotic ratio was higher than the aggregate installment credit to income ratio at the time (it was between 9 and 10 percent in 1954-1956), he concluded that the ratio could continue to rise for some time, despite contemporary concern over credit growth.

FIGURE 2 HERE PLEASE

Despite the simplicity of Enthoven's growth model, it is useful. His prediction has been quite consistent with experience. Although consumer credit growth has been intensely cyclical over the past five decades, and his model is based on a simple (non cyclical) growth path, the aggregate consumer credit to income ratio (the only available consumer credit measure today) appears to have approached an asymptotic limit of 20-25 percent (see Figure 2), only a bit above Enthoven's 1957 projection, based only on installment credit. Data on non installment credit like

department store charge cards, which were more important 50 years ago, were available separately then and might have been included. This would have raised the asymptote somewhat.

Consumer credit outstanding has never exceeded the prediction of his model by very much, and still does not (Figure 2). The ratio of consumer credit outstanding to income converged with the path of the level predicted by a rolling Enthoven model (using moving averages for each of the necessary parameters) by the early 1970s, and the two ratios have tracked one another remarkably closely since that time. An "adjusted" actual consumer credit ratio to income, the third line in Figure 2, assumes that 15 percent of aggregate revolving consumer credit arises in the official statistics from "convenience use" of credit cards, that is, balances that some consumers will pay in full upon receipt of the bill. This series hypothetically eliminates non installment credit from consumer credit and tracks the reconstructed Enthoven limit even more closely than the trend constructed using the official statistics. At year-end 2006, consumer credit outstanding relative to income exceeded the limit predicted by the rolling 1957 model by less than three percentage points, despite decades of contentions that consumer credit has grown "too fast." Relative to income, the series adjusted to remove some "convenience credit" exceeded the rolling Enthoven model by only about one percentage point (Figure 2, dotted line). Again, as with annual percentage change in consumer credit illustrated above, it does not appear that there is anything in the Enthoven perspective of consumer credit trends which suggests that credit experience until 2006 was in any way anomalous.

About a decade after Enthoven's contribution, Helen Manning Hunter (1966) developed a behavioral model of the long term growth of consumer credit based upon her interpretation of relationships revealed in consumer surveys of credit use. Her goal was to employ existing evidence of individuals' credit use to develop hypotheses explaining the high growth of

aggregate consumer credit relative to disposable income over the years 1910-1962. This is the same issue explored by Enthoven, although he focused on the postwar period, and he did not try to develop or to estimate the parameters of a behavioral equation.

Based upon the findings of earlier cross section studies by Lansing, Maynes, and Kreinin (1957) and Miner (1960), Hunter hypothesized that liquid asset holdings, income, change in income, and life cycle stage of individual consumers were the most relevant variables to explain credit growth. She estimated an equation where various measures of consumer credit outstanding or extended were a function of population, average income, and liquid assets.

Hunter's parameter estimates probably do not exhibit long run stability to the 21st century because they depended so much on the depression years of the 1930s and the immediate postwar years, 1946 through the 1950s. She excluded war years 1917-1919 and 1942-1945 as probably abnormal. However, Hunter's analysis of the relevant underlying variables remains useful. Credit use is related to population and income growth, as Enthoven suggested, and possibly to liquid asset changes, even if income elasticity of credit growth does not appear to be as high as Hunter found, now that the effects of the depression of the 1930s and wartime credit restrictions of the 1940s and early 1950s are more distant. Re-estimation of an updated Hunter type equation may have explanatory power over the longer postwar period. Both Enthoven and Hunter demonstrate an important role for income growth in explaining consumer credit growth (income elasticity).

Enthoven's and Hunter's results, as well as the dramatic changes in US financial markets, products, institutions, wealth, and population since their publication, make this a particularly interesting time to explore whether consumer and mortgage credit have recently increased relative to other economic factors. As indicated, the media continue to portray credit usage as

being out of control whenever business cycles and economic conditions appear to deteriorate. Much of the time there is no distinction between short term and long term trends.

III. DATA AND TRENDS

Data

Over the long term, both real consumer credit excluding mortgage credit and real consumer credit probably have been influenced by a wide range of factors that can be classified either as macroeconomic influences or consumer factors (Table 2). Most of the variables in the table potentially reflect both supply and demand influences, as necessary for a truly long run analysis.[4] Data for most of these variables are available in the Federal Reserve Flow of Funds Accounts; these extensive time series permit a long-run perspective on some of the questions that Enthoven, Hunter, and others have considered. These data allow a truly long run analysis that spans numerous business cycles and recessions, periods of considerable economic growth, several war periods, housing bubbles, and credit crunches. The Flow of Funds data are updated and revised regularly so that definitions are as consistent as possible over time and trends can be identified that may not be evident from other sources or over shorter periods.

TABLE 2 HERE PLEASE

Regression Models

To examine consumer and mortgage credit growth in a multivariate framework, linear and log-linear regression models are estimated for 1946 – 2006 to test influences of variables that Hunter explored. The log-linear models are easier to interpret and make more sense for a lengthy time series because the coefficients are directly observable long run elasticities. To estimate elasticities for the linear models, the slopes must be evaluated at a particular point in

[4]In an interesting paper, Gross and Souleles (2002) found an influential role for supply changes in the form of credit line increases and interest rate changes in their micro study of credit card credit, but they did not have information on consumer demand influences and the study concerned only a short segment, approximately one year, of one business cycle episode.

time, such as the mean of the time series, which provides elasticity at approximately the midpoint between 1946 and 2006. The midpoints in these time series (approximately 1976) are not of particular interest or significance, relative to the whole credit time series.

For many consumers, levels of consumer and mortgage credit may be jointly determined. This is tested by estimating two-stage as well as ordinary least squares models. Consumer credit is expected to be influenced by mortgage credit levels, but the reverse is not so likely. After obtaining a new mortgage, purchasers may pursue additional consumer credit to settle into the abode, to maintain it, and to satisfy the desires associated with home ownership. After increasing consumer credit significantly, however, it is not so likely that a borrower will be able to obtain new mortgage credit, unless a prospective borrower has significant other assets.

The substantive hypothesis for this approach and the foundation for the dynamic credit models is that consumer and mortgage credit each grow with real disposable income and that there may be other important explanatory factors for each. The factors may or may not be the same for consumer and mortgage credit. Preliminary tests show that mortgage credit levels influence consumer credit but not vice versa. Consequently, two stage least squares is applied to estimate growth elasticities for consumer credit but not for mortgage credit. The classical auto-regressive transformations are employed to remove autocorrelation.

Tests show that the log linear models also have higher coefficients of determination, and so the linear models are eliminated from further consideration. The results for these log linear models are presented in Appendix Tables A.1 - A.4.

Results show that the consumer credit income elasticity is 0.97 and mortgage credit income elasticity is 0.54 for 1946 – 2006 (Table 3), taking other economic factors into account. In other words, neither suggests long term explosive credit growth relative to income, after

taking account of other factors, despite the cyclicality of credit growth that sometimes produces rapid growth for a period of time. Other significant explanatory variables include long term interest rates – represented by the corporate AAA bond rate (CORPAAA), total consumer assets in real terms (TA/CPI), and unemployment. As expected, higher real incomes, lower long term interest rates (costs of funds), and greater levels of consumer assets explain larger amounts of mortgage credit outstanding using this approach. Consumer credit outstanding is not a significant explanatory factor for mortgage credit, but, as expected, mortgage credit is significant in explaining consumer credit growth, the reason for using two stage least squares for the consumer credit equation. The percentage of variation of the dependent variable that is explained by the models is .99 for each model with AR(1) and AR(2) corrections.[5]

TABLE 3 HERE PLEASE

The equations are also estimated including a series of binary variables representing the individual business cycles of post World War II to examine any anomalous cyclic episodes. Table 4 defines binary variables to allow testing for effects of business cycles on consumer and mortgage credit models.

TABLE 4 HERE PLEASE

For the dependent variable log(real mortgage loans), none of the intercept or slope binary variables has a statistically significant coefficient. Table 5 provides consumer credit log linear models that include the binary variables defined in Table 4. Except for 1990-2000, the coefficients of binary intercept and slope variables (IV9000 and IV9000*RDPI, respectively) are

[5]A variety of additional explanatory variables from Table 2 were tested to examine possible associations with real consumer and mortgage credit levels (Tables A.3 and A.4). None of consumer wealth, financial assets, debt, or liquid assets variables improve the model over the specifications in Table 3. Structural variables test whether or not it was a war year, whether or not the 1986 tax revisions had an impact on mortgage or consumer credit outstanding, the effects of levels of consumer confidence, represented by the University of Michigan survey, and whether or not it was a recession year. The only significant factor over the long period was whether the economy was in a recession year, and when this consideration was included, the significance of the coefficient of real assets deteriorates relative to other specifications.

not statistically significant, and then only for consumer credit. For this period, the income elasticity of consumer credit growth is 1.6141 (.9997 +.6144). Much of the growth in consumer credit during this period is due to growth in the use of credit cards. Johnson (2005) studied this period in more detail and concludes that declines in credit card interest rates in a competitive environment, greater availability of credit cards to riskier borrowers during these years, and growing use of credit cards for transactions purposes (as opposed to credit use) led to increased card credit in the official statistics. These explanations fall well short of runaway consumer profligacy. Because wealth effects are also a possibility, asset and wealth levels and the University of Michigan Consumer Sentiment Index are included in the specification. Total assets proved statistically significant at the .05 level in the mortgage credit but not in the consumer credit equation.[6]

TABLE 5 HERE PLEASE

Although these results provide income elasticities for consumer and mortgage credit, they do not reveal whether the individual credit time series are stationary (with no unit root) or whether the two credit measures are cointegrated. These issues are explored, along with dynamic models, in the following section.

IV. DYNAMIC MODELS

To explore more fully, long term growth of consumer and mortgage credit, separately and jointly, vector autoregressive models are developed below. Vector autoregressive estimators with error correction (VAREC) provide dynamic long term economic models and credit impact

[6]A series of events from 1978 to the early 1980s eliminated rate ceilings (usury ceilings) from credit cards (Supreme Court case Marquette National Bank of Minneapolis vs. First of Omaha Service Corp., 439 U.S. 299), mortgage credit (Monetary Control Act, 12 U.S.C. 226), and some other kinds of credit in some places (various state actions). These actions enabled lenders to continue to offer credit products when interest rates rose, and over time they contributed to making credit markets more competitive overall. During the years after these events, interest rates generally fell, however, and the impact of growing competition likely was gradual. In any event, changes during these years would be accounted for in the equations by the TAX86 variable, which equals 1 for these years and 0 otherwise. Likewise, technological change in credit management during these years due to advances in statistical credit scoring methodologies that also likely enhanced competitive conditions would be accounted for by the same variable.

multipliers. The VAREC models are formulated from the log-linear OLS and two stage regression models in Table 3. VAREC models allow tests of joint long-term growth of consumer and mortgage credit. The process requires tests for unit roots, cointegration, and VAREC parameter estimates.

Tests for Unit Roots and Cointegration

Figure 1 shows that real consumer credit excluding mortgage credit (RCC = CC/CPI) and real mortgage credit outstanding (RMC = MC/CPI) have both grown extensively since 1946. This evidence suggests two hypotheses for dynamic analysis:

H1: RCC and RMC are non-stationary with one unit root, or integrated of order one, I(1)

H2: RCC and RMC are cointegrated.

Testing H1 requires an Augmented Dickey – Fuller (ADF) test. The existence of one unit root is confirmed for each series.

Letting *Z* represent RCC and then RMC, H1 is tested applying two models:

$$Z_t = \beta_0 + \rho Z_{t-1} + \beta_1 \Delta Z_{t-1} + \beta_2 \Delta Z_{t-2} + \varepsilon_t \quad (1)$$

Equation (1) allows the ADF test for a unit root in RCC and RMC, where the null and alternative hypotheses are H_0: $\rho = 1$ and H_A: $\rho < 1$. Replacing RCC and RMC by ΔRCC and ΔRMC, respectively, for Z in equation (1), allows testing for a second unit root with the same model.

The ADF test provides t-statistics for equation (1), -2.62 for RCC and -1.63 for RMC, both of which are above the 5 percent critical value of -2.91. The null hypothesis cannot be rejected and the conclusion is that each series has a unit root. For the first differences of RCC and RMC, the t-statistics are -4.23 for ΔRCC and -3.25 for ΔRMC, which are below -2.91, so the hypothesis of a second unit root is rejected. Removing either the second lag term or the constant from equation (1), produces similar results and the same conclusion.

Since both series are I(1), whether they are cointegrated is determined using Johansen's test (Johansen, 1991). Of the various cases allowed in this testing regime, the most appropriate assumption appears to be "Series that have means and linear trends, but the cointegrating equation has only an intercept," that is, case 3 of the five possibilities for the Johansen test. The results (developed using EVIEWS 5) are summarized in Table 6. There is a single cointegrating relationship between the consumer credit and mortgage credit series

Table 6. Johansen Cointegration Tests

Hypothesized cointegrations (logRCC & logRMC)*	Trace statistic	5% critical value	probability
none	20.2629	15.49	0.0088
at most 1	0.4348	3.84	0.5097

Cointegration equations: one at 5%
* linear deterministic trend

Autoregressive Models and Impact Multipliers

A vector autoregressive model with an error correction term (VAREC) accommodates the cointegration (Engle and Granger, 1987). This model takes the general form

$$\begin{pmatrix}\Delta RCC_t\\ \Delta RMC_t\end{pmatrix}=\begin{pmatrix}\beta_{0C}\\ \beta_{0M}\end{pmatrix}+\begin{pmatrix}\beta_{1CC} & \beta_{1CM}\\ \beta_{1MC} & \beta_{1MM}\end{pmatrix}\begin{pmatrix}\Delta RCC_{t-1}\\ \Delta RMC_{t-1}\end{pmatrix}+\begin{pmatrix}\beta_{2CC} & \beta_{2CM}\\ \beta_{2MC} & \beta_{2MM}\end{pmatrix}\begin{pmatrix}\Delta RCC_{t-2}\\ \Delta RMC_{t-2}\end{pmatrix}+\begin{pmatrix}\beta_{3C}\\ \beta_{3M}\end{pmatrix}X_t+\begin{pmatrix}\gamma_C\\ \gamma_M\end{pmatrix}EC_{t-1}+\begin{pmatrix}\varepsilon_{Ct}\\ \varepsilon_{Mt}\end{pmatrix}$$

The error correction term is:

$$EC_t = RCC_t + \alpha_0 + \alpha_1 RMC_t$$

The model may include exogenous variables, *X*. Several models are estimated, including the exogenous variables listed in Table 2 and each set of binary variables listed in Table 4, to reflect the nine business cycles since World War II. Binary variables are tested to see if the intercept

and the effect of log(RDPI) are different for each business cycle. No binary variable is tested for 1946 – 1952 because this period is reflected in the intercept and slope.

The most significant statistical evidence includes intercept binary values for 1974-1979 and 1980-1989 and a slope binary variable for 1974-1979 (Table 7). The t-statistic for the cointegration coefficient that includes these three binary variables is highly significant, and the binary variables are all statistically significant at a meaningful level. Including these three binary variables provides the highest R-square and the best fitting model, minimizing the system's Akaike information criterion. The statistical results for alternatives in Table 4 are summarized in Table 5 and are substantially inferior to those provided in Table 7.

TABLE 7 HERE PLEASE

Including these binary variables in the VAREC models provides results in terms of differences with lag intervals for endogenous variables ΔlogRCC and ΔlogRMC. Lag intervals must be specified for the two endogenous variables to capture the expected autoregressive responses within and between the two endogenous variables.

The following conclusions result from Table 7:

1. The logRCC and logRMC series are non-stationary but move together as shown by the earlier tests.

2. ΔlogRCC does not have an autoregressive relationship at lags 1 and 2.

3. ΔlogRMC has a positive autoregressive relationship at lag 1, a negative relationship at lag 2, and a significant negative cross correlation with ΔlogRCC at lag 1.

4. Both variables have significant positive relationships with ΔlogRDPI and significant negative relationships with CORPAAA.

5. Two binary variables (IV7479, IV8089, and the interaction IV7479*ΔlogRDPI are important for both ΔlogRCC and ΔlogRMC.

Impact Multipliers

The coefficients of Δlog(RDPI) in Table 7 are credit impact multipliers. Dynamic short-run impact multipliers for real consumer credit and real mortgage credit in response to changes in real disposable income can be determined directly from the VAREC model in Table 7. The short-run impact multipliers are the coefficients of ΔlogRDPI, except for 1974-1979 when the multipliers are the sum of the coefficients of ΔlogRDPI and IV7479*ΔlogRDPI from the VAREC models. The long-run elasticities are "equilibrium" solutions to the models in Table 7. The long-run consumer credit multiplier can be determined, assuming

$\Delta logRCC_t = \Delta logRCC_{t-1} = \Delta logRCC_{t-2}$ and $\Delta logRMC_t = \Delta logRMC_{t-1} = \Delta logRMC_{t-2}$,

and determining simultaneous solutions to the equations in Table 7. These results for consumer credit are in the upper panel of Table 8.

Table 8. Consumer Credit Impact Multiplier and Income Elasticity

1. VAREC results (from Table 7)

	Short-run		Long-run	
Impact multiplier	Except 1974-1979	1974 -1979	Except 1974-1979	1974-1979
Consumer Credit	0.3785	1.5081	0.2280	1.0902

2. Elasticity - Impact Multiplier Links

	Elasticity (ΔRCC/ΔRDPI) (RDPI/RCC)	Impact Multiplier (ΔRCC/ΔRDPI)	Inverse Ratio (RDPI/RCC)	Ratio (RCC/RDPI)
Consumer credit	1.01	.23	4.41	.2268

This panel shows that the long-run consumer credit impact multiplier, outside of the mid seventies, is very close to Enthoven's 1957 estimate of the limit of the debt-income ratio of 0.21

for 1946-1950, 0.17 for 1950-1956, 0.21 for 1954-1956, and 0.19 for 1945-1956. The only substantial difference is for the mid 1970s, which warrants further investigation.

The lower panel of Table 8 contrasts two-stage least squares consumer credit elasticity for 1946-2006 (from Table 3) with the long-run consumer credit multiplier from the same period derived from the VAREC models with the binary variables for 1974-1979 and 1980-1989 (from Table 7). There is consistency between the consumer credit elasticity and impact multiplier. The credit elasticity is the product of its impact multiplier and the real disposable income - real credit ratio or factor (1.01 = .23 x 4.41). The consistency is proved by comparing the inverse of the factor or ratio of real credit to real disposable income with aggregate US income data. The Flow of Funds Accounts demonstrate the aggregate ratio of these two variables has fluctuated within the relatively narrow range of .17 to .25 for more than 45 years.

V. FORECASTING 2007 AND 2008

Expectations and method

The data (1946-2006) and estimated consumer and mortgage VAREC model (Table 7) can be applied to predict the levels of RCC and RMC for 2007 and 2008. (References to RCC and RMC in this section are to ΔlogRCC and ΔlogRMC.) With the benefit of hindsight, the performance of the U.S. economy for these two years suggests that the long-term model, estimated from World War II through the economic boom of 2001-2006, should over-predict the actual levels of consumer and mortgage credit for 2007 and 2008. Since the economy began sliding into recession towards the end of 2007, only slight over-estimates would be expected for that year. Likewise, it is not anticipated that the dramatic 2008 recession would be forecast by the long-term model, given the factors taken into consideration.

Forecasting RCC and RMC for 2007, requires RCC and RMC for 2006 and 2005, estimated EC for 2006 using RCC and RMC for 2006, and contemporaneous values for RDPI and CORPAAA. Thus 2007 data were used for RDPI and CORPAAA so that the forecasts are ex-post rather than ex-ante. Similarly, the forecasts for 2008 employ revised data for 2007 for RCC and RMC, estimated EC for 2007, and 2008 data for RDPI and CORPAAA. Forecasted 2007 values for RCC and RMC could be employed in forecasting 2008, but we prefer to focus upon one-step-ahead forecasts.

Results

Table 9 shows the forecast errors for 2007 and 2008 for both consumer and mortgage credit relative to the actual values available both in December 2007 and December 2009. For 2007, the forecast RCC and RMC errors from the estimated VAREC model are 1.39 percent and 0.49 percent, respectively. The revised 2005 and 2006 values of RCC and RMC and 2007 values for RDPI provide very similar forecasts, with slightly smaller error for RCC (0.89 percent) and larger error for RMC (1.64 percent). The results for 2008 are even more interesting. The worst recession since the depression has been identified by the National Bureau of Economic Research to have begun in December 2007 and the financial crisis that followed suggest that an effective long-run model should not be expected to forecast 2008 credit levels without significant error, especially for mortgage credit. The 2008 forecast errors are 6.47 percent for consumer credit and 11.25 percent for mortgage credit, and somewhat smaller employing the revised 2005-2008 data that became available in 2009.

The 2008 forecast errors would surely be expected to be larger than the 2007 errors. According to a December 7, 2009 Federal Reserve press release, within 2008 there was considerable credit volatility. Consumer credit peaked in July 2008 at $2.6 trillion and declined

for nine consecutive months; forecasts based upon shorter time periods would clearly show a different picture.

Table 9. Forecast Errors for 2007 and 2008

	Actual data available in 2007		Actual data available in 2009	
	Δlog RCC	Δlog RMC	Δlog RCC	Δlog RMC
2007	-0.0139	-0.0049	-0.0089	-0.0164
2008	-0.0647	-0.1125	-0.0626	-0.0942

VI. CONCLUSIONS

Enthoven in the 1950s and Hunter in the 1960s, contributed valuable analytical studies on long run trends in consumer credit, but there are relatively few sophisticated studies in this area since their work. The media often offer judgments about credit activity and imply that trends and circumstances have changed dramatically in recent years. This study provides a time series analysis of consumer and mortgage credit trends since World War II and shows that credit growth has not changed so dramatically since then.

A vector autoregressive error correction (VAREC) model provides short-run and long-run credit impact multipliers for consumer credit. The VAREC impact multipliers are consistent with the two stage least squares elasticities. Except for six years at the end of the seventies, the consumer credit impact multiplier of 0.23 estimated here is very close to the credit-income limit that Enthoven projected more than 50 years ago.

One test for the effectiveness of the estimated consumer and mortgage VAREC model is to examine whether it performs as expected outside of the estimation period. Forecasted levels for RCC and RMC for 2007 and 2008 should and do over-predict the actual levels of consumer and mortgage credit for 2007 and 2008. Since the current recession began towards the end of

2007, only slight over-estimates are expected and observed for that year. As expected, for 2008 credit levels are over estimated with significant error.

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Table 1. Selected Measures of Assets, Debts, and Income of American Consumers, Selected Years, 1945-2006

	1945	1955	1965	1975	1985	1995	2005	2006
	Current Dollars (billions)							
Disposable Personal Income[1]	161	283	498	1187	3109	5408	9036	9523
Total Assets	742	1569	2868	5902	16,572	32,612	64,014	68,920
Financial assets	560	1015	1954	3665	9938	21,386	38,886	42,116
Deposits	104	172	373	908	2506	3332	6049	6870
Other financial	456	843	1581	2757	7432	18,054	32,837	35,446
Total Liabilities	30	144	352	761	2360	5052	12,220	13,293
Home mortgages	19	88	219	459	1442	3325	8883	9676
Consumer credit	7	43	98	207	611	1169	2327	2438
Other liabilities	4	13	35	95	307	558	1011	1179
Net Worth	711	1425	2516	5142	14,211	27,560	51,795	53,626
	2006 Dollars (billions)							
Disposable Personal Income[a]	1803	2129	3187	4448	5825	7153	9327	9523
Total Assets	8310	11,803	18,355	22,116	31,049	43,140	66,079	68,920
Financial assets	6272	7635	12,506	13,734	18,619	28,290	40,140	42,116
Deposits	1165	1294	2387	3402	4695	4408	6244	6870
Other financial	5107	6341	10,118	10,331	13,925	23,882	33,896	35,446
Total Liabilities	336	1083	2253	2852	4422	6683	12,614	13,293
Home mortgages	213	662	1402	1720	2701	4398	9170	9676
Consumer credit	78	323	627	776	1145	1546	2402	2438
Other liabilities	45	98	218	356	575	738	1044	1179
Net Worth	7963	10,719	16,102	19,268	26,626	36,457	53,465	53,626

Source: Federal Reserve Statistical Release Z1, "Flow of Funds Accounts of the United States," various issues. Figures shown are year end, not seasonally adjusted. Some lines include assets and debts of nonprofit organizations.
[1]Measured as annual rate; figure in 1945 column is for 1946.

Table 2. Macro-Economic and Consumer Factors

Macro-Economic Factors

Variable	Definition
CPI	Consumer Price Index
DPI	Disposable Personal Income
DPI/CPI	Real Disposable Income
TBILL6	Short-term Interest Rates, Measured by the Six-Month Treasury Bill Rate
CORPAAA	Long-term Interest Rates, Measured by the Corporate AAA Rate
U	Unemployment Rate
RECYRS	Recession Years
WAR	War Years (Korea, Viet Nam, Iraq)

Consumer Factors

Variable	Definition
CC/CPI	Real Consumer Credit Outstanding, Excluding Mortgage Credit
MC/CPI	Real Mortgage Credit Outstanding, Excluding Consumer Credit
TA/CPI	Real Consumer Sector Total Assets
FA/CPI	Real Consumer Sector Financial Assets
WEALTH/CPI	Real Consumer Sector Total Wealth
TAX86	Represents 1986 Changes in Tax Laws. Variable = 0 before1986; and = 1 after 1986
MICH	Annual Index of Consumer Sentiment, Estimated by the University of Michigan Survey Research Center, Beginning in 1952
FINAS/CPI	Real Consumer Sector Total Financial Assets

Table 3. Income Elasticities of Mortgage and Consumer Credit Growth

Log-linear Mortgage Credit Ordinary Least Squares

Dependent Variable	Intercept	DPI/CPI	CORPAAA	TA/CPI	$\bar{R}^2$/F
MC/CPI	1.5550	0.5447	-0.1144	0.1384	.99
	(1.30)	(5.30)***	(-3.25)**	(2.05)*	19256.

Log-Linear Consumer Credit Two-Stage Least Squares

Dependent Variable	Intercept	DPI/CPI	CORPAAA	U	MC/CPI+	$\bar{R}^2$/F
CC/CPI	-1.6510	0.9728	-0.1056	-0.1068	0.5576	.99
	(-7.12)***	(9.70)***	(-2.80)**	(-3.30)**	(4.33)***	2906.

All variables are expressed in natural logarithms.

***** Statistically significantly different from 0 at the .05 level
****** Statistically significantly different from 0 at the .01 level
******* Statistically significantly different from 0 at the .001 level
\+ Estimated values from first stage.

Table 4. Business Cycle Periods and Binary Variable Definitions

Date	Period Characterization	Intercept Binary	Slope Binary
1946-1952	post WW II	0	0
1953-1959	Eisenhower years	IV5359	IV5359*DPI
1960-1969	Kennedy-Johnson years	IV6069	IV6069*DPI
1970-1973	Nixon years	IV7073	IV7073*DPI
1974-1979	Ford-Carter	IV7479	IV7479*DPI
1980-1989	Reagan years	IV8089	IV8089*DPI
1990-2000	Bush I-Clinton	IV9000	IV9000*DPI
2001-2006	Bush II	IV0106	IV0106*DPI

Binary variables introduced to models A.1.1 and A.2.1 for successive business cycle expansions. Each binary variable has a value of 1 for the years within the cycle, and 0 otherwise; 1946-1952 are represented by the original intercept and slope.

Table 5. Consumer Credit Log Linear Models With Binary Variables for the 1990s

dependent variable is log(CC/CPI)

Intercept	DPI/CPI	CORPAAA	U	MC/CPI+	IV9000	IV9000 * DPI	$\bar{R}$4F
-1.6618	0.9997	-0.115	-0.1253	0.5538	-2.2882	0.6144	.99
(-17.22)**	(25.03)**	(-5.35)**	(-4.63)**	(12.40)**	(-3.98)**	(3.83)**	2909.
-1.6281	0.9839	-0.114	-0.1319	0.5794	-0.0724		.99
(-10.22)**	(14.05)**	(-3.91)**	(-4.32)**	(6.98)**	(-3.10)*		2841.
-1.627	0.9826	-0.1136	-0.1312	0.5801		-0.0195	.99
(-9.97)**	(13.68)**	(-3.84)**	(-4.13)**	(6.78)**		(-2.96)*	2815.

All variables are expressed in natural logarithms. t-statistics in parentheses

***** Statistically significantly different from 0 at the .01 level

****** Statistically significantly different from 0 at the .001 level

\+ Estimated values from first stage.

AR(1) and AR(2) transformations are applied to each model

For consumer credit, the coefficients of both the intercept (IV9000) and slope (IV9000&DPI) are significantly different from zero. The coefficient of IV9000 is -2.2882 and the coefficient of IV9000*DPI is 0.6144. The intercept for the model is -1.6618 throughout 1946-2006; for 1990-2000 it is -4.5438 (= -1.6618 - 2.2852). The elasticity for consumer credit with respect to disposable income is 0.9997 for 1946-2006 except for 1990-2000 when it is 1.6141 = 0.9997 + 0.6144. In the 1990s consumer credit increased considerably faster than disposable income, holding other factors constant. The income elasticity for 1946-1989 was close to 1.0, supporting the claim that consumer credit that excludes mortgage credit increased at the same rate as disposable income, except for the decade of the 1990s. Much of the consumer credit growth in the 1990s was due to increased use of credit cards, as documented by Johnson (2005).

Table 7. VAREC Model of Credit Growth

Variable	$\Delta logRCC_t$	$\Delta logRMC_t$
Constant	-0.8982 (-3.01)	-0.4617 (-3.02)
$\Delta logRCC_{t-1}$	0.1342 (0.85)	-0.1661 (-2.05)
$\Delta logRCC_{t-2}$	-0.0649 (-0.46)	0.0488 (0.67)
$\Delta logRMC_{t-1}$	-0.3073 (-0.90)	0.5627 (3.22)
$\Delta logRMC_{t-2}$	-0.4634 (-1.54)	-0.3950 (-2.56)
EC_{t-1}	-0.1156 (-3.87)	-0.0584 (-3.81)
ΔlogRDPI	0.3785 (3.88)	0.2063 (4.12)
CORPAAA	-0.0277 (-4.25)	-0.0192 (-5.76)
IV7479	-3.5449 (-2.96)	-1.4044 (-2.29)
IV7479*ΔlogRDPI	1.1296 (2.96)	0.4545 (2.32)
IV8089	0.0818 (2.38)	0.0690 (3.92)
R-square	0.62	0.79

Cointegrating relationship: $EC_t = \log(RCC_t) - 3.7073 + 1.0523 \log(RMC_t)$ t = 2.29.
IV7479 (=1 for 1974–1979, 0 otherwise) IV8089 (=1 for 1980-1989, 0 otherwise)
t-statistics appear in parentheses.

The logRCC and logRMC series are non-stationary but move together as shown by the earlier tests. ΔlogRCC does not have an autoregressive relationship at lags 1 and 2. ΔlogRMC has a positive autoregressive relationship at lag 1, a negative relationship at lag 2, and a significant negative cross correlation with ΔlogRCC at lag 1. Both variables have significant positive relationships with ΔlogRDPI and significant negative relationships with CORPAAA. Two binary variables (IV7479, IV8089, and the interaction IV7479*ΔlogRDPI are important for both ΔlogRCC and ΔlogRMC.

Figure 1. Growth Rates in Consumer and Mortgage Credit

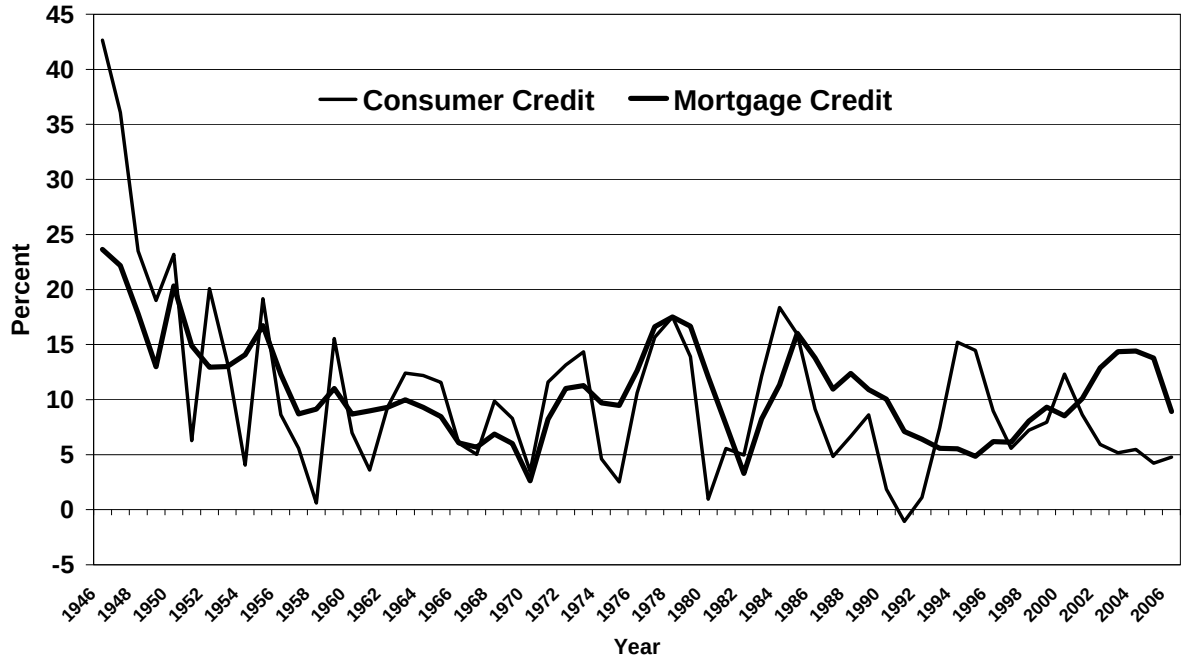

Figure 2. Enthoven's Limit

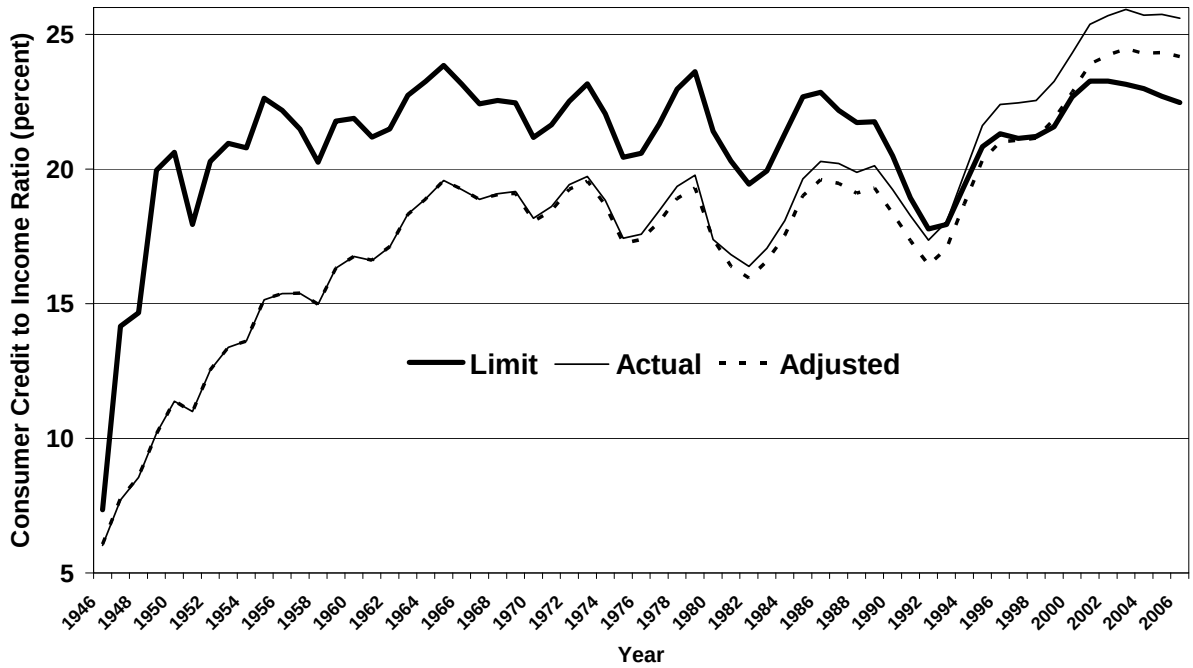

Table A.1. Linear Mortgage Credit OLS Models
Dependent variable is (MC/CPI)

Model	Intercept	DPI/CPI	CORPAAA	TA/CPI	Other
A.1.1	1010.007	0.1636	-0.1262	0.0122	
	(0.01)	(1.98)*	(-2.28)*	(2.07)**	
A.1.2	288,958.30	0.1465		0.0164	0.008 TBILL6
	(0.00)	(1.58)		(2.72)**	(0.22)
A.1.3	1069.355	0.1157	-0.1768		-0.0605 U
	(0.01)	(1.20)	(-3.14)**		(-1.48)
A.1.4	-1.3570	0.1566	-0.1395		0.0096 WEALTH/CPI
	(-0.21)	(1.84)	(-2.44)*		(1.56)
A.1.5	-0.3690	0.1496	-0.1659		-0.0004 FINAS/CPI
	(-0.06)	(1.69)	(-2.90)**		(-0.25)
A.1.6	-1.4276	0.0249	-0.1520		0.2431 LIQASST/CPI
	(0.31)	(0.29)	(-3.01)**		(3.86)*
A.1.7	-1.4240	0.1568	-0.1317	0.0114	0.0248 WAR
	(-0.22)	(1.80)	(-2.29)*	(1.85)	(0.20)
A.1.8	236,569.8	0.1594	-0.1252	0.0119	-0.0301 TAX86
	(0.00)	(1.89)	(-2.19)*	(2.04)*	(-0.11)
A.1.9	-0.9750	0.1530	-0.1321	0.0113	0.0012 MICH
	(-0.13)	(1.42)	(-2.14)*	(1.68)	(0.18)
A.1.10	-1.5582	0.1333	-0.1196	0.0116	-0.0583 RECYRS
	(-0.22)	(1.53)	(-2.05)*	(1.93)	(-0.91)

t-statistics in parentheses
***** Statistically significantly different from 0 at the .05 level
****** Statistically significantly different from 0 at the .01 level
******* Statistically significantly different from 0 at the .001 level
The R-square for each model is 0.99. AR(1) and AR(2) transformations are applied to each model.

Table A.2. Linear Consumer Credit Two-Stage Least Squares Models
dependent variable is (CC/CPI)

Model	Intercept	DPI/CPI	CORPAAA	U	MC/CPI	Other
A.2.1	-0.3891	0.2108	-0.068	-0.0518	0.0668	
	(-1.22)	(9.09)***	(-2.80)**	(-3.04)**	(3.01)**	
A.2.2	-0.4532	0.1861		-0.0561	0.0862	-0.0119 TBILL6
	(-1.30)	(7.86)***		(-2.54)**	(3.69)***	(-0.61)
A.2.3	-0.3507	0.2136	-0.0697	-0.0511	0.0724	-0.0012 TA/CPI
	(-1.07)	(8.78)***	(-2.80)**	(-2.96)**	(2.69)**	(-0.40)
A.2.4	-0.3271	0.2141	-0.0702	-0.0505	0.0744	-0.0019 WEALTH/CPI
	(-0.99)	(8.99)***	(-2.85)**	(-2.94)**	(-2.88)**	(-0.63)
A.2.5	-0.3967	0.2117	-0.0677	-0.0522	0.0651	0.0002 FINAS/CPI
	(-1.24)	(8.96)***	(-2.76)**	(-3.03)**	(2.79)**	(0.30)
A.2.6	-0.4263	0.1839	-0.0698	-0.0537	0.0650	0.0292 LIQUASST/CPI
	(-1.22)	(5.10)***	(-2.86)**	(-3.17)**	(2.79)**	(1.02)
A.2.7	-0.4041	0.2122	-0.0677	-0.0522	0.0656	0.0218 WAR
	(-1.27)	(8.96)***	(-2.77)**	(-3.03)**	(2.89)**	(0.37)
A.2.8	-0.3758	0.2108	-0.0686	-0.0518	0.0663	0.0179 TAX86
	(-1.18)	(8.99)***	(-2.74)**	(-3.01)**	(2.91)**	(0.14)
A.2.9	0.0413	0.2045	-0.0734	-0.0690	0.0702	-0.0016 MICH
	(0.10)	(8.47)***	(-2.96)**	(-3.69)***	(3.05)**	(0.62)
A.2.10	-0.3757	0.2091	-0.0663	-0.0509	0.0683	-0.0066 RECYRS
	(-1.19)	(8.47)***	(-2.57)**	(-2.88)**	(2.91)**	(-0.20)

***** Statistically significantly different from 0 at the .05 level
****** Statistically significantly different from 0 at the .01 level
******* Statistically significantly different from 0 at the .001 level
The R-square for each model is 0.99. AR(1) and AR(2) transformations are applied to each model.

Table A.3. Log-linear Mortgage Credit OLS Models
dependent variable is log(MC/CPI)

Model	Intercept	DPI/CPI	CORPAAA	TA/CPI	Other
A.3.1	1.5550	0.5447	-0.1144	0.1384	
	(1.30)	(5.30)***	(-3.25)**	(2.05)*	
A.3.2	0.9877	0.4826		0.2342	0.0011 TBILL6
	(0.72)	(3.92)***		(3.37)***	(0.10)
A.3.3	3.2682	0.6914	-0.1498		-0.0188 U
	(0.75)	(4.73)***	(-4.50)***		(-1.17)
A.3.4	1.8219	0.5653	-0.1232		0.0928 WEALTH/CPI
	(1.46)	(5.49)***	(-3.48)***		(1.53)
A.3.5	2.3750	0.5970	-0.1459		-0.0011 FINAS/CPI
	(1.85)	(5.80)***	(-4.36)***		(-0.24)
A.3.6	1.5537	0.5654	-0.1088	0.1318	0.0102 WAR
	(1.20)	(5.47)***	(-3.09)**	(1.97)*	(1.23)
A.3.7	1.5048	0.5502	-0.1171	0.1386	0.0074 TAX86
	(1.28)	(5.26)***	(-3.24)**	(2.04)*	(0.39)
A.3.8	6.2981	0.5533	-0.1057	0.0847	0.0004 MICH
	(0.23)	(3.46)***	(-3.07)**	(1.25)	(1.00)
A.3.9	1.8788	0.5038	-0.1003	0.123	-0.0090 RECYRS
	(1.35)	(5.08)**	(-2.96)**	(1.91)	(-2.32)*

All variables are expressed in natural logarithms.
t-statistics in parentheses
***** Statistically significantly different from 0 at the .05 level
****** Statistically significantly different from 0 at the .01 level
******* Statistically significantly different from 0 at the .001 level
The R-square for each model is 0.99. AR(1) and AR(2) transformations are applied to each model.

Table A.4. Log-Linear Consumer Credit Two-Stage Least Squares Models
dependent variable is log(CC/CPI)

Model	Intercept	DPI/CPI	CORPAAA	U	MC/CPI	Other
A.4.1	-1.6510	0.9728	-0.1056	-0.1068	0.5576	
	(-7.12)***	(9.70)***	(-2.80)**	(-3.30)**	(4.33)***	
A.4.2	-2.4366	1.4961	-0.1694	-0.0905	-0.1129 lag	
	(-5.65)***	(9.84)***	(-2.98)**	(-3.18)**	(-1.33)	
A.4.3	-2.4220	1.2847		-0.0949	0.0231	-0.0110 TBILL6
	(-5.60)***	(5.91)***		(-2.30)*	(0.18)	(-0.47)
A.4.4	-2.6372	1.4829	-0.1708	-0.0887	-0.1248	0.0547 TA/CPI
	(-4.61)***	(6.23)***	(-2.64)**	(-3.07)**	(-0.94)	(0.39)
A.4.5	-2.5439	1.5293	-0.1775	-0.0879	-0.1156	0.0036 FINAS/CPI
	(-5.34)***	(6.84)***	(-2.89)**	(-3.05)**	(-0.92)	(0.34)
A.4.6	-2.5233	1.5166	-0.1781	-0.0879	-0.1091	0.0044 WEALTH/CPI
	(-4.59)***	(6.52)***	(-2.78)**	(-3.03)**	(-0.84)	(0.04)
A.4.7	-2.5273	1.5229	-0.1757	-0.0874	-0.1101	0.0043 WAR
	(-5.38)***	(6.89)***	(-2.80)**	(-3.04)**	(-0.89)	(0.25)
A.4.8	-2.1616	1.3315	-0.1412	-0.1316	-0.0074	-0.0001 MICH
	(-7.53)***	(7.56)***	(-2.95)**	(-5.61)***	(-0.07)	(-0.21)
A.4.9	-2.5260	1.5180	-0.1771	-0.0884	-0.1002	-0.0128 TAX86
	(-5.47)***	(6.94)***	(-2.88)**	(-3.07)**	(-0.81)	(-0.34)
A.4.10	-2.4884	1.4953	-0.1707	0.0860	-0.0945	-0.003 RECYRS
	(-5.24)***	(6.36)***	(-2.56)**	(-2.93)**	(-0.72)	(-0.30)

All variables are expressed in natural logarithms. Levels of consumer credit and mortgage credit may influence each other. New home owners may need additional consumer credit to purchase the essentials to settle into the abode. Increasing consumer credit will deter mortgage lenders from offering new mortgage credit. Thus, consumer credit models should be estimated as two stage least squares models.

t-statistics in parentheses
***** Statistically significantly different from 0 at the .05 level
****** Statistically significantly different from 0 at the .01 level
******* Statistically significantly different from 0 at the .001 level

The R-square for each model is 0.98. AR(1) and AR(2) transformations are applied to each model.

IMPACTS OF TARP ON FINANCIAL INSTITUTIONS

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IMPACTS OF TARP ON FINANCIAL INSTITUTIONS

ABSTRACT

Insolvency for any of the four largest U.S. commercial banks during the 2009 financial crisis could have virtually destroyed the U.S. financial system and would have had serious detrimental effects on global financial markets. There was really no alternative but for the U.S. Treasury to implement the TARP program and to modify the initial plans from purchasing toxic bank assets to injecting capital with the government becoming a senior preferred stockholder. This study provides models of bank stress tests using publicly available data to show the vulnerability of the four largest banks. The consistency between the results in this study and the confidential Federal Reserve Supervisory Capital Assessment Program shows the effectiveness of the models developed here, although the goals of the two analyses were different. The TARP program restored confidence in the U.S. financial system and should be deemed successful. An important result of this study is to promote debate of policy alternatives to avoid the necessity for a future TARP capital injection.

I. INTRODUCTION

The Troubled Asset Relief Program (TARP) was introduced with a September 2008 proposal by U. S. Treasury Secretary Henry Paulson, rejected by the House of Representatives on September 29, and then enacted as part of the Emergency Economic Stabilization Act of 2008 on October 3, 2008. The most important result was for the Federal government to inject $239.5 billion of capital into numerous financial services firms' balance sheets. Now is a good time to model the program's effects on the recipient firms, to consider the public policy implications if TARP had not been implemented, and to review what policy options might avoid the necessity for a similar program in the future. The study examines March 31, 2009 data to model the impacts of TARP on the solvency of banks to reflect the environment shortly after they received capital injections.

Background

TARP has been a historic experience in public sector financial management that has and will have implications for domestic and global finance. This public sector investment has already increased the 2010 fiscal deficit by almost a trillion dollars to an aggregate debt level of almost $14 trillion. At an average long run interest rate of 5 percent, the $700 billion annual cost of financing this additional debt is more than 60 percent of all U.S. federal government annual individual plus corporate income tax receipts. Some TARP funds will never be repaid and the current repayments are being allocated to other public sector programs to try to reduce unemployment, rather than paying off the additional debt incurred to fund TARP. Current projections of the aggregate TARP losses are approximately $117 billion (Fitzpatrick, 2010). These public costs invite vigorous debate, as to whether the TARP expenditures were in the long run public interest, even from those who agreed with necessity of TARP in the short run.

TARP was originally conceived for the U.S. Treasury to purchase toxic assets from financial services firms, providing liquidity for loans to the private sector and stimulating the U.S. economy. The original plan required valuing the bundle of assets the government would have acquired from each institution, which would have been nearly impossible. Valuing individual loan portfolios of the 20 largest financial services firms would have required months of analysis for a large team of experts, an impractical endeavor for US financial regulators.

Thus, the U.S. Treasury chose to employ the TARP funds to acquire preferred stock in approved institutions (mostly large) with an initial 5 percent dividend for the federal government. This investment was deemed to be acceptable for the public sector with the expectation that the capital injection to the right hand side of the institutions' balance sheets would be matched with bank business loans that were expected to stimulate the economy. At the same time, however, the institutions were being warned by their financial regulators to reduce, or at least not increase, the riskiness of their asset portfolios.

Economic Environment of the Financial Crisis

Some of the initial positive impacts of TARP have become evident. The advanced 2009 fourth quarter estimate of GDP growth is reported to be 5.7 percent, of which only 2.3 percent was real growth without inventory adjustments (*Wall Street Journal*, January 30, 2010). For the third quarter of 2009, the preliminary release of real GDP growth was 3.8 percent, which has now been revised downward to only 2.2 percent, so major revisions in the fourth quarter report would not be surprising. Forecasts of highly regarded economists who participated in the February 2010 surveys by the Federal Reserve Bank of Philadelphia (2010) and The Economist (2010) both predict real GDP growth of 3.0 percent for 2010, following negative real growth of 2.4 percent for 2009.

The financial markets, represented by recent stock indices, are signaling some economic progress. Between March 31, 2009 and March 1, 2010, the Dow Jones Industrial Average rose approximately 37 percent from 7,609 to 10,404 and for the four largest banks – J P Morgan Chase, Bank of America, Wells Fargo (after acquiring Wachovia), and Citigroup - their March 1, 2010 vs. March 30, 2009 share prices are: $41.83 vs. $24.85; $16.71 vs. $6.03; $27.35 vs. $13.37; and $3.39 vs. $2.31; respectively.

This Study

The empirical focus of this study is to model stress tests -- as potential asset losses -- applied to major balance sheet items of the four largest banks considered to be "Too Big To Fail".[1] These four banks dominate the U.S. banking system as sources of short-term capital and represent almost 40 percent of American total bank assets. Two additional banks, among 23 TARP banks that have the highest ratios of the particular asset to net loans, are also stress tested for each asset. The 23 banks are those that received at least $1 billion of capital injections.

The assets modeled for the stress tests were those at the greatest risk during the dramatic 2008-2009 deterioration of the U.S. financial markets. The tests are for potential asset losses for the banks' (i) real estate loans, (ii) other loans, (iii) credit card loans, and (iv) off-balance sheet securitized assets. The results are contrasted with the May 2009 Federal Reserve Capital Assessment Program tests and found to be consistent.

Section II delineates the international capital regulatory environment in which the TARP banks operate. Details of the TARP injections and the financial characteristics of the 23 TARP institutions are delineated in Section III. Section IV describes the method the authors have constructed to model the potential stress on the TARP institutions. Section V provides the models and results of the unique stress tests for four asset categories applied to six banks and

compared to the results from the Federal Reserve Capital Assessment Program. The conclusions about the importance of TARP follow in Section VI, which includes a discussion of potential policy recommendations to avoid the need for a future TARP injection.

II. INTERNATIONAL BANK CAPITAL

In the early 1980s, the Federal Reserve and the Bank of England began coordinating some bank capital requirements for the large banks and bank holding companies they supervised. By 1986 the Bank of International settlements in Basel, Switzerland accepted the leadership of the effort and rapidly gained participation of nine countries to accept the proposed Basel 1 capital requirements. (Details on Basel 1 and Basel 2 can be found in Gup, 2004, and Bank for International Settlements, 2004 and 2006). Within a few years, successful implementation of Basel 1 included acceptance of the standard by the World Bank, the International Monetary Fund, and the European Union for their nearly 200 member countries.

Basel 1 Requirements

Basel 1 requirements were based on a bank's book value of total assets, risk adjusted assets, and components of its capital accounts. Some flexibility in the requirements encouraged a wide range of central banks and financial regulators to implement the system.

Risk adjusted assets are the product of the book value of assets in an asset risk category and the weight assigned to that category, cumulated across the four categories: 0% is assigned to cash and various claims on central governments; 20% to securitized mortgages, mortgage backed securities, Federal funds sold, cash items in collection, and Municipal securities; 50% to conventional mortgages and securitized assets other than mortgages; and 100% to unsecuritized loans, industrial revenue bonds, other assets, and fixed assets.

Tier I, or core capital includes common stock, retained earnings, preferred stock with noncumulative dividends, minus goodwill. Tier II capital includes preferred stock with cumulative dividends, loan loss reserves, and capital debentures with at least five year maturities.

Basel 1 required banks to maintain:

(1) total capital as a ratio to total assets of 6 percent

(2) Tier I Capital > 4 percent of Risk Adjusted Assets, and

(3) (Tier I + Tier II) Capital > 8 percent of Risk Adjusted Assets.

Basel 2 Requirements

After approximately a decade, it appeared that more sophisticated requirements should be implemented for the 21st century. After much discussion and analysis, the Bank for International Settlements issued Basel 2 for comment by member countries and their financial regulators.

Basel 2 creates international standards for how much capital banks must retain to mitigate their financial and operational risks. Basel 2 continued Tier I and Tier I plus Tier II capital requirements as percentages of Risk Adjusted Assets and augments risk-weights assigned to asset classes according to their risk *potential.* In addition, to the four asset categories in Basel 1, Basel 2 includes derivative products weighted at 125 percent and off-balance sheet items weighted at 150 percent of their book values.

Basel 2 (Pillar III) also required each institution to develop its own internal risk profile and introduced more regulatory procedures for banks' disclosure of their capital structure.[2] These provisions attempted to increase the effectiveness of Basel 2, requiring bank holding companies to operate according to their risk profile. As market values of risky assets (such as mortgage loans, CMOs, and MBSs) declined, regulators expected institutions to increase their Tier I core capital.

Basel 2 capital requirements could have exacerbated reaction to the financial crisis and public policies as an unintended consequence. The institutions should have increased their Tier I capital for safety and soundness at a time when their asset values were declining. Raising new capital was hardly possible during the crisis. For institutions with negative net incomes, retained earnings were reduced by the amount of these losses.

The policy conflict was that banks needed additional capital and regulators might have encouraged banks to seek it for safety and soundness while capital markets were hardly operating. This policy conflict was not anticipated because Basel 2 focuses on GAAP accounting and book values of bank assets and capital. Basel 2 bank capital requirements were supposed to enhance capital cushions, but the magnitude of the financial crisis was beyond the regulators perspective when Basel 2 was devised. Some approaches for dealing with these conflicts are suggested among the conclusions to the paper.

Potential policy unintended consequences often occur from the best intentions. The FDIC is proposing (Adler, 2010) that banks commit to a minimum one year holding period for most securitized assets. This would damage secondary markets and discourage what were designed as the main benefits of asset securitization – enhancing bank liquidity in place of holding illiquid assets and expanding credit availability.

Some banks became so conservative that they have been properly accused of not serving their borrower communities. They hardly loaned much, if any, of their TARP capital injections. For the 23 TARP banks analyzed in this study, their ratio of net loans to assets for March 31, 2009 was 54.51 percent, 2.28 percentage points below the ratio one year before.

The Basel 2 provisions that are directly relevant for the models in this study are:

(1) total capital as a ratio to total assets of 6 percent

(2) Tier I Capital > 6% of Risk Adjusted Assets

(3) (Tier I + Tier II) Capital > 10% of Risk Adjusted Assets

(4) Tier II Capital < Tier I Capital

(5) off balance sheet securitized assets, derivative products, and off-balance sheet items included as additional components of Risk Adjusted Assets

(5) internal based risk analysis (Pillar III) for each bank

Toxic Assets, Capital Levels, and Costs of Capital

Some of the most toxic assets the institutions held in 2008 were collateralized mortgage obligations (CMOs) and mortgage backed securities (MBSs) linked to real estate loans. Often the book values of these assets far exceeded their market values. Excessive, subprime mortgage loans, sometimes including closing costs, had been committed on inflated "hypothesized" property values to customers with modest incomes. Credit rating agencies underestimated the risk and overestimated or overstated values of securitized assets that supported the real estate loans. Borrowers and lenders often operated under the false premise that real estate values would rise continually so that refinancing more "valuable" property after two or three years would not be difficult, and the new interest rate would be similar to the original mortgage rate.[3]

Flannery (2006, Table 5) calculates the low Basel 2 risk weights for senior AAA claims. His "Table 5 indicates that a AAA senior claim on a diversified loan portfolio will have a risk weight of 7 percent under Basel II" (Flannery 2006, page 26)

In fact, real estate market values declined below book values and many borrowers defaulted on their mortgages, leaving the market value of institutions' asset portfolios well below their book values. With the deterioration of the value of their loan portfolios, banks' retained earnings and Tier I capital declined by the amount of the losses. Annual net income losses further reduced banks' Tier I capital.

Federally insured financial service firms with high leverage (typically debt to equity ratios of 10 to 1) were convinced that their marginal cost of equity was considerably greater than their cost of debt. The cost of the debt was considerably less than its real cost because so much debt was comprised of deposits insured by the public sector, and banks benefitted from the public guarantees and moral hazard.

III. THE TARP PROGRAM AND ITS BANKS

TARP

The TARP program was implemented to protect both the American and global banking systems during the financial crisis. The TARP approach that was implemented continues to be a source of controversy, however, one large American bank failure among the four largest would have been disastrous. Many early TARP opponents are now less vigorous in their objections.

An interesting public finance aspect of TARP, which has hardly been discussed, is the large spread between the dividend rate on the preferred stock TARP injections and the Treasury's low cost of funds. Interest rates on six-month Treasury bills since January 2009 have been below 45 basis points (Federal Reserve Bank of St. Louis, FRED2). TARP injections require the recipient bank to pay at least a 5 percent annual dividend; and there were other risk protections for the Treasury. Thus, it is not surprising that financially sound institutions were determined to repay the funds as soon as the Federal Reserve completed its Capital Assessment Program tests in May 2009 (Board of Governors of the Federal Reserve, 2009).

TARP Institutions

Eighteen commercial banks received a total of $188.5 billion in TARP funds. Two investment banks (Morgan Stanley and Goldman Sachs) each received $10 billion, after

converting to financial holding companies, and accepting some Federal Reserve regulation. In addition, CIT received $2.3 billion, and Discover Financial Services received $1.2 billion.

Table 1 delineates the characteristics of the 23 institutions that received 88.5 percent of the TARP banking funds and at least a $1 billion injection. 58.5 percent of the total TARP capital injections went to the four largest commercial banks -- Citigroup (18.8%), Bank of America (18.8%), Wells Fargo (10.4%), and J P Morgan Chase (10.4%). The first data column of Table 1A shows the amount of TARP funds that each institution received. A star denotes that the funds were repaid to the U. S. Treasury in June, 2009, immediately following the Federal Reserve's Capital Assessment Program tests. Of the total TARP dollar injections to all institutions, 72.2 percent were repaid by March 1, 2010 (www.treas.gov).

Data and Measures

Public data from the FDIC web site (www.fdic.gov) allow calculations of the 23 TARP banks' risk adjusted assets (RAA), solving for RAA from the FDIC's ratio of Tier I Capital/RAA and the level of Tier I Capital. For the TARP banks, the three loan assets to be stress tested represent 47 percent of these banks total assets, and securitized assets represent an additional 22 percent of the banks' assets.

Tables 1A and 1B summarize the March 31, 2009 financial characteristics of the 23 TARP banks. Table 1A provides balance sheet data. Table 1B provides ratios to reflect the riskiness of the banks' loan portfolios, relative to their capital. Means and standard deviations are provided at the bottom of Table 1A. The standard deviation is larger than the mean for each item in Table 1A, demonstrating the spectrum of risk among the insured depository institutions.

The three banks at the bottom of Table 1A – Huntington BancShare, Zions BanCorporation, and Discover Financial Services – may not appear to have needed TARP funds

because their March 2009 Tier I capital ratios were 7.73 percent, 34.95 percent, and 15.21 percent, respectively. However, each of the three was already in precarious financial position by March, 2009, or shortly thereafter. Zions had negative net income and almost 9 times its total capital in real estate loans. Huntington BancShare had 99 percent of its loans in real estate and its ratio of real estate loans to total capital was 341 percent. Discover had 98 percent of its loans in credit card loans, and its ratio of credit card loans to total capital was 512 percent. Moreover, Discover, faced 7 times as much risk in off-balance sheet (unused) credit card loan potential obligations ($187 billion) as its credit card loans outstanding ($25.6 billion).

IV. MODELING TARP INSTITUTIONS' STRESS

The Assets

Impacts of the TARP injections are modeled for four bank assets, representing 69 percent of the total assets for the four largest U.S. banks, plus two additional banks. The assets are:

(1) Real estate loans

(2) Other loans

(3) Credit Card, and

(4) Off balance sheet securitized assets

Real estate loans include 1-4 family residential real estate loans, multifamily residential real estate loans, construction and development loans, and commercial real estate loans. For all 7,038 U.S. banks, as well as the 533 with assets above $1 billion, approximately two-thirds of their real estate loans are residential, and 22 percent are commercial real estate loans. The composition of other loans is 60.25 percent in business loans, with the remainder comprised of personal loans, agricultural loans, loans to financial institutions, broker and dealer loans, and loans to government agencies.

Credit card loans are distinct, unsecured personal loans, which are especially risky during a recession. The off-balance sheet balances are often borrowed by persons who are in the most difficult economic circumstances. In March 2009, the off-balance sheet unused credit card commitments for the TARP banks were 2.4 times their outstanding credit card loan balances. The four largest banks assets' in credit card loans are much smaller than their real estate loans, other loans, or securitized assets. 16 of the 23 TARP borrowers had less than one percent of their net loans in credit card loans. However, Discover Financial Services had 98 percent of its net loans as credit card loans.

The 23 banks' securitized assets represent 17.6 percent of their total assets, but only six have more than $10 billion in securitized assets. Modeling securitized assets is particularly important because new accounting requirements demand that banks report securitized assets within their balance sheets.

Derivatives are an important off-balance sheet bank asset, but the reported notional dollars on the FDIC reports of condition probably overstates their economic value and potential risk to the bank. To determine their appropriate risk you need a net value against forward positions that are not recorded on the FDIC statements. Therefore, the TARP banks' derivatives are not analyzed here.

The Banks

Stress tests are applied to six banks for each of the four assets. The four largest banks, which comprised $4.5 trillion of the aggregate $12 trillion total U.S. bank assets, as of March 31, 2009, are stress tested for each asset. Two smaller banks are examined because they have the largest amount of their assets at risk in a particular asset category. For real estate loans the two additional banks are: HuntingtonBancShares with 99.1 percent of their net loans in real estate

loans and Zions BanCorporation with 75.4 percent of their net loans in real estate loans. CIT and State Street Bank had 99.9 and 95.9 percent of their net loans in other loans, respectively.

Stress tests for two additional banks, beyond the four largest banks, include highly vulnerable institutions. Stress testing business loans for CIT, for example, is critical, but less than one percent of its loans are supported by real estate. The investment banks that obtained TARP funds are not stress tested because they have virtually no insured deposits, a different asset composition from commercial banks, and a different role in the economy. Also, they operate in a somewhat different regulatory environment than insured depository institutions, although they converted to financial holding companies to access TARP funds.

V. APPLYING THE STRESS TESTS

For each of the four asset stress tests, it is assumed that either 10 percent or 20 percent of a particular bank's assets in that category could be lost. These are rather small percentage loss assumptions for the banks considering the magnitude of the financial crisis. Book value assets are reduced by the hypothesized loss, loan loss expenses increase, and capital is reduced by the same amount. The high likelihoods of at least these percentage losses without TARP are illustrated by the institutions' 2009 balance sheets.

The results of the asset stress tests and models are reported in Tables 2A-2D and Table 3. Each portion of Table 2 presents the impact on one of the four largest banks. Since each asset test is sequential, the aggregate effect for each bank is sum of the four tests. Table 3 provides the impacts for two smaller banks, labeled Bank 1 and Bank 2 in the table.

Tables 2 and 3 model the stress on a bank's total assets, Tier I Capital as a ratio to Risk Adjusted Assets, and the Total Capital-Total Asset Ratio. The *actual* column represents a bank's March 31, 2009 position and the *scenario* column is the result after applying the "stress" (losing

10 or 20 percent of funds in an asset category). The data in Tables 2 and 3 represent the circumstances approximately five months after the TARP injections. Without the TARP funds, these banks' the financial characteristics as of March 2009 would not be so acceptable as those delineated in Tables 1A and 1B.

Citigroup (Table 2A)

If Citigroup were to lose 10 percent of its real estate loans, other loans, or securitized assets, the bank's capital-asset ratio would decline to 7.46%, 7.42 %, or 4.96%, respectively. Such losses on real estate or other loans reduce Citigroup's Tier I Capital ratio (Tier I Capital/RAA) to slightly below 8 percent, which does not violate Basel 2 requirements. A 20 percent loss of Citigroup's securitized assets would be disastrous. Its Total Capital-Total Asset ratio would become 0.36 percent and its Tier I Capital – Risk Adjusted Asset ratio would become -0.97 percent. A 10 or 20 percent loss of its Credit Card Loans hardly affects Citibank's capital position, but the bank has three times as much in off-balance sheet credit card potential loans, at customers' discretion, than credit card loans outstanding.

The conclusion for the Citigroup stress tests is that any substantial additional losses among its real estate loans, other loans, or securitized assets after March 31, 2009 would have endangered its balance sheet. Without the TARP injections, Citigroup would have been in more difficulty than it has experienced. For those who accept efficient share price markets, Citigroup's share price near $1 in March 2009 reflected market expectations.

Bank of America (Table 2B)

The 2009 Bank of America (BofA) financial position is partially the result of their numerous acquisitions in the past decade. After merging with NationsBank and re-locating its headquarters to Charlotte, North Carolina in 1997, BofA completed acquisitions of MBNA (a

highly profitable Delaware credit card bank) in June, 2005, Countrywide (a mortgage lender) in July, 2008, and Merrill Lynch (the nation's largest retail brokerage firm) in March, 2009. The resulting institution is a very different financial services firm from the one that had developed in California as a west coast regional lender with a great deal of credit card activity.[4]

The impacts of potential real estate loan losses or other loan losses for BofA would be serious and not dissimilar to the same percentage losses for Citigroup. 10 and 20 percent real estate loan or other loan losses for BofA would reduce the Bank's Tier I Capital and Capital - Asset ratios to levels of concern and below even the Basel I requirements.

The impacts of potential credit card loan losses would not appear to be serious for BofA. However, after the acquisition of MBNA, BofA's credit card loans represent 8.9 percent of its loan portfolio. BofA held securitized assets of only 4 percent of total assets in March of 2009. Therefore, a deterioration of these assets would not have seriously impaired the bank's capital.

JPM (Table 2C)

J P Morgan Chase (JPM) is the result of Jamie Dimon's successful acquisitions when he was President of Chicago First National Bank and his return to New York, where he had previously been denied in his quest to become President of Citibank. In Chicago, under the name of BancOne, Dimon combined BancOne, previously headquartered in Columbus, Ohio; Chicago First National Bank; and the National Bank of Detroit, Michigan. Upon his return to New York, he merged BancOne into J P Morgan in July of 2004 and then acquired Chase Manhattan Bank in 2008 to form JPM Chase. JPM Chase had done due diligence for a possible acquisition of Bear Stearns in 2008, and when Bear Stearns was failing in March 2009, JPM Chase was the preferred emergency acquirer at a very low price.

JPM could not have withstood significant losses to its real estate loans, other loans, or securitized assets without impairing its capital position. A 20 percent loss to any of these three assets would have reduced JPM's Capital - Asset ratio and Tier I Capital to Risk Adjusted Assets ratios below the Basel 2 requirement.

Wells Fargo (Table 2D)

Wells Fargo was in a different position from the other three large banks. During the financial crisis, Wells Fargo agreed to acquire Wachovia Bank on October 3, 2008 and to accept the associated risks. As part of the acquisition, Secretary Paulson extended an unusual tax provision to Wells Fargo. Instead of the usual merger allowance to exempt $1 billion from taxable profits annually for 20 years, Secretary Paulson committed the Internal Revenue Service, as part of the U.S. Treasury, to exempt $20 billion of profits from taxable income as Wells Fargo would choose to apply the exemption. This immediate potential exemption almost doubles the present value of the $20 billion exemption and greatly increased the long run value of the acquisition.

The results of the stress tests for Wells Fargo are not very different from those for Citigroup. A 10 percent Wells Fargo asset loss in real estate loans, other loans, or securitized assets would leave Wells Fargo with unacceptable Tier I and total capital positions. As a result of any of the three prospective 10 percent losses, the bank's Tier I Capital – Risk Adjusted Asset ratio would be below 5 percent, and its largest Capital - Asset ratio would be below 6 percent. In each instance a Basel 2 requirement would be violated. If the loan loss ratios were 20 percent, Wells Fargo would have miniscule capital positions. Only the bank's credit card loan portfolio appears to be capable of sustaining a 10 or 20 percent loss.

Bank 1 and Bank 2 (Table 3)

Table 3 provides results comparable to Tables 2A – 2D for two additional banks. Bank 1 and Bank 2 will be different institutions for each asset category. Banks 1 and 2 are the two banks with the highest percent of their net loans in the particular asset category being examined.

Huntington BancShares and Zions Bancorporation each had more than 250 percent of its capital in real estate loans (see Table 1) in March 2009. For 10 or 20 percent real estate loan losses, the capital position for Huntington BancShares would be damaged, and Zions Bancorporation's capital would be severely impaired.

Discover Financial Services is the only institution among the TARP banks for which credit card losses might have threatened their solvency. Some of the four largest banks have significant credit card activity, but they were probably large enough to withstand major credit card losses.

Other loans, including commercial and personal loans (unrelated to credit cards) are critical assets for CIT, as a predominantly small business lender. CIT was unable to sustain major loan losses and their creditors nearly foreclosed in August 2009, three months before the bank entered bankruptcy. CIT's capital-asset ratio would have been greatly impaired by a 10 or 20 percent loss of its other loans, which include business loans.

Aggregate Asset and Capital Losses

The scenarios for the assets of the four largest banks can be aggregated since each bank is stress tested independently for each asset. The impacts of combined losses of 20 percent of real estate loans and other loans for the large banks are shown in Table 4.

The conclusion is clear. On the basis of March 31, 2009 data, each of the four largest

U. S. banks would have been in a precarious capital position if the bank had lost 20 percent of *each* of the four assets that are stress tested. After the 20 percent losses, the *largest* values of Tier I Capital/Risk Adjusted Assets (0.27 percent) and Total Capital/Total Assets (1.09 percent) would have belonged to Citigroup.

Modeling 20 percent losses is not unrealistic. Between March 31, 2008 and the same date in 2009, the Dow Jones Industrial Average declined 38 percent (from 12,263 to 7,609), unemployment rose from 5.0 to 8.9 percent, and housing foreclosures increased even more rapidly. These economic experiences are evidence that the percentage of losses analyzed in this paper were realistic concerns for the U.S. financial system.

Stress Tests vs. the Fed Capital Assessment Program

The scenarios that have been developed in this study are quite similar to the Supervisory Capital Assessment tests that were applied in the spring of 2009 by the Board of Governors of the Federal Reserve (2009a) and summarized by Chairman Bernanke (2009). Each emphasizes the ratio of total capital to total assets and the composition of capital (tier I capital as a ratio to risk-adjusted assets) to examine the riskiness of the TARP banks. The Federal Reserve employed the tests to examine the additional capital injection that might be needed for the banks to remain solvent if the economy deteriorated further. The Federal Reserve tests were completed just before some TARP banks were permitted to repay their "loans" in June. On November 9, 2009 the Fed (Board of Governors, 2009b) announced that 9 of the 10 bank holding companies that had been determined to need capital in May 2009 were in now compliance.

The similarity between the results of this study and the Fed's tests reflects the effective modeling applied here, even though the purposes of the two approaches are different. This study shows how important the TARP program was to support the institutions during the financial crisis. Bernanke (2009) says the Fed's "assessment program was a forward-looking, 'what-if'

exercise intended to help supervisors gauge the extent of the additional capital buffer to keep these institutions strongly capitalized and lending, even if the economy performs worse than expected between now and the end of next year."

VI. CONCLUSIONS AND POLICY CONSIDERATIONS

TARP Results

The four largest US banks had combined total assets of $4.8 trillion on March 31, 2009. If all four had failed and the U.S. government realized 50 percent of the book value of their assets, the loss to taxpayers would have exceeded $2 trillion. Instead, TARP injected $239.5 billion into approximately 35 financial institutions; $212 billion was injected into the 23 institutions in Table 1, earning approximately a 5 percent dividend. Virtually the total injection will be repaid by 2012. 72 percent of the total TARP injection has been repaid by March 2010. For 2009, the Treasury's TARP revenue from the 23 institutions with a 5 percent preferred stock dividend should have exceeded $10 billion, while the six-month Treasury bill rate was always below one half of one percent.

The failure of even the smallest of the four largest commercial banks could have virtually destroyed the U.S. financial system and would have had global implications. There was really no alternative but for the U.S. Treasury to implement the TARP program. Even the delayed bankruptcy filing by CIT and reorganization while they continued lending to small firms, instead of their bankruptcy during the height of the crisis, should be viewed as a benefit of TARP.

The TARP program restored confidence in the U.S. financial system, as proved by the market results since March 2009. March 2009 data include the immediate impacts of TARP and reflect what could have occurred without the capital injection. TARP should be deemed a success by virtually any standard.

Avoiding the Need for Another TARP

A number of suggestions are being offered to avoid the need for future TARP injections. A combination of these approaches can be the basis for a policy solution.

Flannery (2005) offered one of the few suggestions shortly before the financial crisis. He proposed that financial institutions be required to hold reverse convertible debentures that would be automatically converted to core capital if the *market* value of an institution's capital fell below a pre-established threshold. Flannery (2010) has expanded his analysis and retitled his debentures as contingency capital certificates (CCC), which would provide a safety net to large financial institutions without public sector capital injections. Flannery would require CCCs to be held as bank debt that would automatically convert to core capital on the basis of declining market values of bank equity, without regulatory intervention or legislative action.

Kashyap, Rajan, and Stein (2008) recommend that depository institutions be required to purchase capital insurance from which they would receive a capital infusion in a crisis. This proposal has some similar aspects to what Flannery has proposed, but capital infusions from insurance would require cooperation and possibly negotiation between the crisis institution and the insurance company. Moreover, if the same company insured numerous banking institutions during a crisis similar to 2008-2009, the insurance company or industry would probably require public sector assistance.

Paul Volker, advisor to President Obama, former Federal Reserve Chairman, and former President of the New York Federal Reserve Bank, has proposed an approach (2010) that is a partial return to 1933 Glass-Steagall requirements that were eliminated by the Financial Modernization Act of 1999. Volker would require that institutions eligible for public sector financial support separate their activities between those on behalf of their customers and those on

behalf of the institution and its owners. Volker's proposal would separate proprietary trading, hedge funds activity, and equity trading and not provide public financial support for these activities if they faced substantial losses.

Others have recommended substantially increased capital requirements for institutions so that they could sustain losses in a crisis and remain solvent. For example, an institution might be required to have a 10 percent ratio of core capital to risk adjusted assets, which would be permitted to decline to 8 percent if the market value of a bank's assets deteriorated in a crisis. With an 8 percent capital ratio, an institution could continue to function, but further losses would put the institution at risk. This approach would provide the regulators with time to deal with one declining institution, but the results of the stress tests of 10 or 20 percent asset losses in the current study suggest that temporary forbearance is not much of a solution to protect several large institutions during a significant financial crisis.

Conclusion

TARP provided temporary support for the U.S. and global financial systems while restoring some confidence that markets would return toward normalcy. Aggregate TARP losses, estimated to be $117 billion on the investment of $581 billion, compared to the potential cost of a single failure of a very large bank, are not excessive. Long term solutions are being debated as part of the pending U.S. financial legislation and public policy changes.

END NOTES

[1] Paul Volker has claimed that the Obama regulatory reform proposals will maintain a policy of "Too Big To Fail" and could lead to future bailouts (see Wagner (2009, November 4). Volker recommends that reform proposals should exclude nonbank financial firms from the policy of "Too Big To Fail." He would also separate the most risky activities that *are not* services on behalf of consumers from the activities for which the public sector would provide support.

[2] U.S. regulators of insured depository institutions had already implemented a similar provision for large banks as part of their CAMELS analysis, which included capital adequacy (C), asset quality (A), capability of management (M), liquidity (L) , and sensitivity to market risk (S). (see Federal Reserve Bank of Chicago, 1997).

[3] Many of these loans were 2/28 and 3/27 subprime loans for which the initial low interest rate would rise dramatically at the end of 2 or 3 years, respectively, unless they could be refinanced. As property values declined, lenders refused refinancing, borrowers could not afford the higher rates (often more than twice the original rate), and foreclosures began.

[4] Today's VISA credit card began in 1958 as BankAmericard, a subsidiary of Bank of America.

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TABLE 1A. TARP Bank Data (March 31, 2009 $ in 000,000's)

Institution	TARP Injection	Total Assets	Total Capital	Tier 1 Capital	Net Loans	Real Estate Loans	Credit Card Loans	Other Loans	Risk Adjusted Assets	Securitized Assets
JPMorgan Chase & Co.	*$25,000	$1,688,164	$130,548	$100,437	$609,261	$352,472	$19,704	$237,085	$1,129,775	$190,459
Bank of America Corporation	$45,000	$1,434,037	$135,296	$89,936	$763,828	$381,988	$67,960	$313,881	$1,031,380	$59,170
Citigroup Inc	$45,000	$1,143,561	$109,321	$98,657	$518,701	$240,254	$34,242	$244,205	$673,427	$525,722
Wells Fargo & Company	$25,000	$552,170	$45,096	$34,837	$350,619	$203,699	$15,684	$131,236	$452,429	$265,375
The Goldman Sachs Group	*$10,000	$161,455	$14,838	$14,699	$4,724	$567	$0	$4,157	$135,475	$13,569
Morgan Stanley	*$10,000	$66,742	$5,993	$5,998	$13,279	$550	$0	$12,729	$45,166	$0
PNC Financial Services	$7,579	$140,011	$11,300	$9,353	$72,940	$38,208	$1	$34,730	$115,897	$598
U.S. Bancorp	*$6,599	$258,527	$21,764	$14,969	$180,411	$86,070	$13,066	$81,274	$221,434	$0
SunTrust Banks, Inc	$4,850	$174,237	$18,779	$12,444	$128,292	$78,862	$483	$48,947	$154,013	$127,393
Capital One	*$3,555	$118,175	$20,995	$8,558	$65,873	$30,530	$0	$35,343	$78,511	$0
Regions Financial Corp	$3,500	$137,000	$14,322	$9,707	$95,795	$70,647	$0	$25,147	$111,569	$171
Fifth Third Bancorp	$3,408	$68,458	$5,589	$4,973	$42,235	$19,683	$840	$21,711	$56,965	$18
BB&T Corp	*$3,134	$139,275	$13,622	$11,540	$96,238	$69,533	$101	$26,603	$108,560	$0
Bank of New York Mellon	*$3,000	$163,006	$11,980	$12,210	$30,893	$5,228	$0	$25,665	$100,164	$0
KeyCorp	$2,500	$95,515	$8,316	$7,814	$72,494	$31,946	$5	$40,543	$97,311	$0
CIT Group, Inc	$2,330	$3,882	$544	$543	$1,976	$1	$0	$1,975	$2,350	$0
Comerica Inc	$2,250	$67,462	$5,672	$5,671	$47,844	$20,806	$6	$27,032	$69,749	$0
State Street Corporation	*$2,000	$142,458	$14,168	$13,631	$7,660	$677	$0	$6,983	$74,205	$0
Marshall & Iisley Corporation	$1,715	$54,994	$4,532	$4,014	$43,240	$29,456	$0	$13,784	$49,991	$13
Northern Trust Corporation	*$1,576	$65,796	$4,466	$4,547	$18,334	$5,248	$0	$13,086	$41,297	$0
Zions BanCorporation	$1,400	$21,163	$1,243	$1,439	$14,308	$10,786	$94	$3,428	$18,612	$0
Huntington BancShares	$1,398	$451	$61	$62	$210	$208	$0	$2	$177	$0
Discover Financial Services	$1,224	$37,527	$4,999	$5,028	$26,068	$72	$25,596	$400	$33,056	$0
Average	$9,218	$292,786	$26,237	$20,481	$139,357	$72,934	$7,730	$58,693	$208,761	$51,412
Standard Deviation	$13,068	$468,132	$40,500	$30,904	$212,205	$111,955	$16,346	$87,714	$314,188	$124,718

* Institutions that repaid their TARP funds in June 2009

TABLE 1B. TARP Bank Ratios March 31, 2009

Institution	Total Capital: Total Assets	Tier 1 Capital: Risk-Adjusted Assets	Total Risk-Based Capital: Risk-Adjusted Assets	Net Loans: Total Assets	Real Estate: Net Loans	Credit Card: Net Loans	Other Loans: Net Loans	Securitized Assets: Total Assets
JPMorgan Chase & Co.	7.73%	8.89%	12.66%	36.09%	57.85%	3.23%	38.91%	11.28%
Bank of America Corporation	9.43%	8.72%	12.19%	53.26%	57.38%	8.90%	41.09%	4.13%
Citigroup Inc	9.56%	14.65%	18.19%	45.36%	46.32%	6.60%	47.08%	45.97%
Wells Fargo & Company	8.17%	7.70%	11.87%	63.50%	58.10%	4.47%	37.43%	48.06%
The Goldman Sachs Group, Inc	9.19%	10.85%	14.54%	2.93%	12.00%	0.00%	88.00%	8.40%
Morgan Stanley	8.98%	13.28%	16.74%	19.90%	4.14%	0.00%	95.86%	0.00%
The PNC Financial Services Group	8.07%	8.07%	11.13%	52.10%	52.38%	0.00%	47.61%	0.43%
U.S. Bancorp	8.42%	6.76%	10.80%	69.78%	47.71%	7.24%	45.05%	0.00%
SunTrust Banks, Inc	10.78%	8.08%	11.04%	73.63%	61.47%	0.38%	38.15%	73.11%
Capital One Financial Corporation	17.77%	10.90%	12.22%	55.74%	46.35%	0.00%	53.65%	0.00%
Regions Financial Corp	10.45%	8.70%	11.88%	69.92%	73.75%	0.00%	26.25%	0.12%
Fifth Third Bancorp	8.16%	8.73%	11.46%	61.69%	46.60%	1.99%	51.41%	0.03%
BB&T Corp	9.78%	10.63%	13.29%	69.10%	72.25%	0.11%	27.64%	0.00%
Bank of New York Mellon Corp	7.35%	12.19%	15.67%	18.95%	16.92%	0.00%	83.08%	0.00%
KeyCorp	8.71%	8.03%	12.09%	75.90%	44.07%	0.01%	55.93%	0.00%
CIT Group, Inc	14.00%	23.12%	24.38%	50.89%	0.03%	0.01%	99.96%	0.00%
Comerica Inc	8.41%	8.13%	11.95%	70.92%	43.49%	0.01%	56.50%	0.00%
State Street Corporation	9.95%	18.37%	19.87%	5.38%	8.84%	0.00%	91.16%	0.00%
Marshall & Iisley Corporation	8.24%	8.03%	11.94%	78.63%	68.12%	0.00%	31.88%	0.02%
Northern Trust Corporation	6.79%	11.01%	14.00%	27.86%	28.63%	0.00%	71.37%	0.00%
Zions BanCorporation	5.88%	7.73%	10.08%	67.61%	75.38%	0.66%	23.96%	0.00%
Huntington BancShares	13.57%	34.95%	35.43%	46.56%	99.11%	0.00%	0.89%	0.00%
Discover Financial Services	13.32%	15.21%	16.64%	69.47%	0.28%	98.19%	1.54%	0.00%
Average	9.68%	11.86%	14.79%	51.53%	44.40%	5.73%	50.19%	7.66%
Standard Deviation	2.70%	6.39%	5.65%	22.80%	26.90%	20.33%	27.59%	19.53%

Table 2A. Citigroup (March 31, 2009 $ in 000,000,000s)

	Assets		Total Asset & Tier 1 Capital Loss	Tier 1 Capital: Risk Adjusted Assets	Total Capital: Total Assets
				Before Loss = 14.64%	Before Loss = 9.56%
	Before Loss	After Loss		After Loss	After Loss
10% Real Estate Loan Loss	$240.20	$216.18	$24.02	11.08%	7.46%
20% Real Estate Loan Loss	$240.20	$192.16	$48.04	7.51%	5.36%
10% Credit Card Loan Loss	$34.20	$30.78	$3.42	14.13%	9.26%
20% Credit Card Loan Loss	$34.20	$27.36	$6.84	13.63%	8.96%
10% Other Loans Loss	$244.20	$219.78	$24.42	11.02%	7.42%
20% Other Loans Loss	$244.20	$195.36	$48.84	7.39%	5.29%
10% Securitized Asset Loss	$525.70	$473.13	$52.57	6.84%	4.96%
20% Securitized Asset Loss	$525.70	$420.56	$105.14	-0.97%	0.36%

Table 2B. Bank of America (March 31, 2009 $ in 000,000,000s)

	Assets		Total Asset & Tier 1 Capital Loss	Tier 1 Capital: Risk Adjusted Assets	Total Capital: Total Assets
				Before Loss = 8.72%	Before Loss = 9.44%
	Before Loss	After Loss		After Loss	After Loss
10% Real Estate Loan Loss	$382.00	$343.80	$38.20	5.01%	6.77%
20% Real Estate Loan Loss	$382.00	$305.60	$76.40	1.31%	4.11%
10% Credit Card Loan Loss	$68.00	$61.20	$6.80	8.06%	8.96%
20% Credit Card Loan Loss	$68.00	$54.40	$13.60	7.40%	8.49%
10% Other Loans Loss	$313.90	$282.51	$31.39	5.67%	7.25%
20% Other Loans Loss	$313.90	$251.12	$62.78	2.63%	5.06%
10% Securitized Asset Loss	$59.20	$53.28	$5.92	8.14%	9.02%
20% Securitized Asset Loss	$59.20	$47.36	$11.84	7.57%	8.61%

Table 2C. JP Morgan Chase (March 31, 2009 $ in 000,000,000s)

	Assets		Total Asset & Tier 1 Capital Loss	Tier 1 Capital: Risk Adjusted Assets	Total Capital: Total Assets
				Before Loss = 8.89%	Before Loss = 7.73%
	Before Loss	After Loss		After Loss	After Loss
10% Real Estate Loan Loss	$352.50	$317.25	$35.25	5.77%	5.64%
20% Real Estate Loan Loss	$352.50	$282.00	$70.50	2.65%	3.55%
10% Credit Card Loan Loss	$19.70	$17.73	$1.97	8.71%	7.61%
20% Credit Card Loan Loss	$19.70	$15.76	$3.94	8.54%	7.50%
10% Other Loans Loss	$237.10	$213.39	$23.71	6.79%	6.33%
20% Other Loans Loss	$237.10	$189.68	$47.42	4.69%	4.92%
10% Securitized Asset Loss	$190.50	$171.45	$19.05	7.20%	6.60%
20% Securitized Asset Loss	$190.50	$152.40	$38.10	5.51%	5.47%

Table 2D. Wells Fargo (March 31, 2009 $ in 000,000,000s)

	Assets		Total Asset & Tier 1 Capital Loss	Tier 1 Capital: Risk Adjusted Assets	Total Capital: Total Assets
				Before Loss = 7.69%	Before Loss = 8.17%
	Before Loss	After Loss		After Loss	After Loss
10% Real Estate Loan Loss	$203.70	$183.33	$20.37	3.19%	4.48%
20% Real Estate Loan Loss	$203.70	$162.96	$40.74	-1.31%	0.79%
10% Credit Card Loan Loss	$15.70	$14.13	$1.57	7.35%	7.88%
20% Credit Card Loan Loss	$15.70	$12.56	$3.14	7.00%	7.60%
10% Other Loans Loss	$121.20	$109.08	$12.12	5.01%	5.97%
20% Other Loans Loss	$121.20	$96.96	$24.24	2.33%	3.78%
10% Securitized Asset Loss	$265.40	$238.86	$26.54	1.83%	3.36%
20% Securitized Asset Loss	$265.40	$212.32	$53.08	-4.04%	-1.45%

Table 3. Bank 1 and Bank 2 Capital Losses*

Real Estate Loans	Bank 1 Huntington BancShares			Bank 2 Zions BanCorporation		
Real Estate Loans:Net Loans	99.11%			75.38%		
Real Estate Loan Loss Effects	Before Loss	10% Loss	20% Loss	Before Loss	10% Loss	20% Loss
Tier 1 Capital:Risk-Adjusted Assets	34.95%	23.28%	11.53%	7.74%	1.94%	-3.86%
Total Capital:Total Assets	13.57%	8.91%	4.30%	5.83%	0.78%	-4.32%

Credit Card Loans	Bank 1 Discover Financial Services			Bank 2 U.S. Bancorp		
Credit Card Loans:Net Loans	98.19%			7.24%		
Credit Card Loan Loss Effects	Before Loss	10% Loss	20% Loss	Before Loss	10% Loss	20% Loss
Tier 1 Capital:Risk-Adjusted Assets	15.21%	7.47%	-0.28%	6.76%	6.17%	5.58%
Total Capital:Total Assets	13.32%	6.50%	-0.32%	8.42%	7.91%	7.41%

Other Loans	Bank 1 CIT Group			Bank 2 State Street Corporation		
Other Loans:Net Loans	99.96%			95.86%		
Other Loans Loss Effects	Before Loss	10% Loss	20% Loss	Before Loss	10% Loss	20% Loss
Tier 1 Capital:Risk-Adjusted Assets	23.12%	14.70%	6.30%	18.37%	17.43%	16.49%
Total Capital:Total Assets	14.00%	5.09%	-10.18%	9.95%	9.46%	8.97%

Securitized Assets	Bank 1 PNC Bank			Bank 2 Sun Trust Bank		
Securitized Assets:Total Assets	0.43%			73.11%		
Securitized Assets Loss Effects	Before Loss	10% Loss	20% Loss	Before Loss	10% Loss	20% Loss
Tier 1 Capital:Risk-Adjusted Assets	8.07%	8.02%	7.97%	8.08%	-0.20%	-8.49%
Total Capital:Total Assets	8.07%	8.03%	7.99%	10.78%	3.45%	-3.87%

*Banks 1 and 2 are the two banks with the highest percent of their net loans in a particular asset category

Table 4. Aggregate Losses* (March 31, 2009 $ in 000,000,000s)

BANK	Total Assets	Total Capital	Asset & Capital Losses	Tier 1 Capital: Risk Adjusted Assets	Total Capital: Total Assets
				AFTER 20% Loss	
JP Morgan Chase	$1,688.20	$130.50	$117.92	-1.55%	0.75%
Bank of America	$1,434.00	$135.30	$139.18	-4.78%	-0.27%
Citigroup	$1,143.60	$109.30	$96.88	0.27%	1.09%
Wells Fargo	$552.20	$45.10	$66.98	-7.11%	-3.96%

*20% aggregate loss for the sum of real estate and other loans